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THE APPERCEPTION OF THE SPOKEN SENTENCE : A STUDY IN THE PSYCHOLOGY OF LANGUAGE.

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I.

INTRODUCTION.

Despite the important rôle which it plays in the mental life, language has, until recently, received but scant attention from the psychologist. While all have recognized the significance of language both as a medium for the transmission of experience,¹ and as the precondition of the higher 'intellectual' processes,² very few have attempted a detailed analysis of the verbal idea, and only within a few years has the psychophysics of verbal expression and verbal perception been adequately exploited. It is true that some of the Herbartians, especially Lazarus³ and Steinthal,⁴ have given the discussion of language an important place in their psychological systems, and it is true that the English school—Hartley,⁵ Locke,⁶ and James Mill⁷ in particular—have made much of the function of the word in conceptual thought. But the Herbartian treatment of language was limited to the part which verbal symbols played as the condensed representatives of the Herbartian 'Ideas;' and the English treatment of language belongs rather to logic and epistemology than to psychology. In the

¹ Wundt, W.: *Grundzüge der physiologischen Psychologie*. Leipzig, 1893, Vol. II, pp. 610 ff. James, W.: *Principles of Psychology*. N. Y., 1900, Vol. II, pp. 356-358. Hoefler, A.: *Psychologie*. Wien und Prag, 1897, pp. 537 ff.

² Ladd, G. T.: *Psychology, Descriptive and Explanatory*. N. Y., 1894, pp. 379 ff. Sully: *Outlines of Psychology*. London, 1885, pp. 337 ff.

³ Lazarus, M.: *Das Leben der Seele*. Berlin, 1878, pp. 213 ff.

⁴ Steinthal, H.: *Einleitung in die Psychologie und Sprachwissenschaft*. Berlin, 1881, pp. 290 ff.

⁵ Hartley, D.: *Observations on Man*, 4th ed. London, 1801, pp. 268 ff.

⁶ Locke, J.: *An Essay Concerning the Human Understanding*. Oxford, 1894, Vol. II, Book iii.

⁷ Mill, J.: *Analysis of the Phenomena of the Human Mind*. 2d ed. London, 1878, pp. 127 ff.

earlier literature of the experimental school, the phenomena of language are strangely neglected. The early studies on the association of ideas used the word as a convenient instrument of experimentation, and the related work upon reaction times involved many of the psychological and physiological principles of vocal expression as well as the psychophysics of symbolic perception; but in neither of these instances was language the primary interest. And yet, notwithstanding this early neglect, there has within the past decade been a very promising growth of monographic literature devoted solely to the psychophysics of language as such. If this growth continues at its present rate, the time will come within a very few years when this literature, together with the philological and pathological studies bearing upon the same problems, must be condensed and classified into a true psychology of language. The time is, of course, not yet ripe for such a systematic treatment, but in lieu of the guide which it would afford, the following very brief enumeration of the fields which such a compendium must cover may serve to introduce our own problem, and to give it the advantage of an orientation which, even if tentative and inadequate, will at least be logical.

The general psychology of language divides itself logically into two great sections: (1) the psychology of language considered as the preconditioning mechanism of the higher mental processes; and (2) the psychology of language considered as the medium of communication, through the agency of which experience is transmitted from individual to individual. To the first section belong the introspective studies and analyses of the verbal idea, its composition in terms of sense-modalities and its function in 'thought.' The monographs of Stricker¹ and of Raymond Dodge² are examples of the work which will fall under this rubric. The second section includes the great mass of material which deals with word-perception, the psychological unit in reading, speech development, and the phenomena of aphasia, all of which will fall within one or other of two subsections: (a) the psychology of symbolic expression; and (b) the psychology of symbolic interpretation.

The former subsection deals with the conscious processes that are correlated with the expression of symbols, either by gesture, by manual signs, by writing or by speech. It is manifestly a department of the psychology of action, but its problems have hitherto been treated mainly by the genetic or

¹ Stricker, S.: Studien über die Sprachvorstellungen. Wien, 1880.

² Dodge, R.: Die motorische Wortvorstellungen. Halle Dissertation, 1896.

by the pathological method. Among the genetic studies of expression, the work of Baldwin,¹ Preyer,² Perez,³ Schultze,⁴ Noble,⁵ Kirkpatrick,⁶ Tracy,⁷ and Lukens⁸ furnishes valuable data regarding the ontogenesis of speech. These data must, of course, be verified and supplemented by further observations, and finally interpreted in the light of some comprehensive theory of mental development. In connection with the pathology of expression, the work of Wernicke, Grashey, Lichtheim, Freud, Hughlings-Jackson, Kussmaul, Exner, Charcot, Déjérine, Bastian, Starr, and Elder is too well known to require especial mention. Many of the monographs are already classics in the literature of psychiatry. A general summary of their results, however, interpreted from a psychological rather than from a clinical standpoint, has long been wanting. Perhaps the most satisfactory attempt to fill this want is represented by Joseph Collins's recent work.⁹ Bawden's monograph,¹⁰ dealing as it does with the border-line between normal and abnormal expression, will also find its place in this subsection.

The latter subsection—the psychology of symbolic interpretation—deals with the conscious processes that are correlated with the perception of symbols and the apperception of their meaning. It is to this chapter of the psychology of language that the present study belongs. It represents an attempt to determine the nature and relations of the factors which are involved in the perception of spoken symbols and in the apperception of their meaning. Inasmuch, however, as the study was suggested by recent investigations upon the psychophysics of visual perception, a general discussion of the factors involved in any form of symbolic perception, as well as a brief review of these other investigations, will not be out of place.

If we consider symbols apart from their 'meaning' and look

¹ Baldwin, J. M.: *Mental Development in the Child and the Race.*

² Preyer: *Mind of the Child.* Trans. Brown. N. Y., 1888. *Mental Development of the Child.* Trans. Brown. N. Y., 1893.

³ Perez, B.: *The First Three Years of Childhood.* Trans. A. M. Cristie. Chicago, 1895.

⁴ Schultze, F.: *Die Sprache des Kindes.* Leipzig, 1880.

⁵ Noble, E.: *Child-Speech and the Law of Mispronunciation.* *Education*, Sept. and Oct., 1898.

⁶ Kirkpatrick, E. A.: *How Children Learn to Talk, etc.* *Science*, Sept., 1891.

⁷ Tracy, F.: *The Psychology of Childhood.* Boston, 1895.

⁸ Lukens, H. T.: *A Preliminary Report on the Learning of Language.* *Pedagogical Seminary*, Vol. III, pp. 424-460.

⁹ Collins, J.: *The Genesis and Dissolution of the Faculty of Speech.* New York, 1898.

¹⁰ Bawden, H. H.: *A Study of Lapses.* *Psychological Review Monograph Supplement*, Vol. III, No. 4 (Whole No. 14), April, 1900.

at them simply as different forms of stimuli appealing to one or another of the sense-departments, it is manifest that certain psychophysical principles condition their efficiency for perception. (1) The symbols must over-step the spatial, qualitative, temporal and intensive limina of the sense-department to which they appeal; and (2) the symbolic elements must over-step the differential limen of the modality to which they belong, *i. e.*, they must, as perceptive elements, be discriminably different. In the ordinary visual symbolism, these differences are spatial,—differences of form, of spatial extent, of spatial position. In the typical auditory symbolism—speech—the differences in the expressive stimuli are more complicated. They are (1) a qualitative difference, (2) a temporal difference (both of which may be called primary differences), and (3) an intensive difference (which is more or less secondary in its nature). In more concrete terms, the differences in the symbolic elements appealing to the ear are: (1a) in the case of consonants, modal differences of a complex nature due to the different forms of adjustment and release of the various parts of the vocal apparatus concerned in the production of consonants; (1b) in the case of vowels, simpler qualitative differences due to the modifications of the laryngeal clangs by the changes in the form of the pharynx and the buccal cavity; (2a) temporal differences within the complex temporal unit of expression (rhythm); (2b) temporal differences in the rapidity with which one symbol element succeeds another symbol element (quantity and pause); (3) intensive differences, due to the fact that certain symbol elements may be emphasized and that the innervation for certain other symbol elements may be weakened.

It is evident that a psychophysical examination of the conditions underlying the perception of symbols must proceed along the lines marked out by an analysis similar to that given above. One of the problems of such an investigation would be the determination of the value of each of these factors in word and sentence perception. This we find to be the point of view of those who have recently approached the study of language from the psychophysical side. They have consistently held to the problem of perception, and they have treated this problem according to psychophysical methods. This work has, however, been confined almost exclusively to visual perception, and the majority of monographs that have been produced are studies in the psychology of reading.

Cattell¹ made the first important experimental determination of the time required for the perception of letters and words. His prin-

¹Cattell, J. McK.: Ueber die Zeit der Erkennung und Benennung, etc. Phil. Studien, Vol. I, pp. 635 ff.

capital conclusions are as follows. (1) The maximal rapidity with which a word can be read, when given in a context, varies directly with the subject's knowledge of the language to which the word belongs; (2) if the words do not form sentences, and the letters do not form words, the time required for reading them is approximately doubled; the time required for the perception of a letter is very little shorter than that required for the perception of a word; (3) the less familiar a word is, the smaller is the difference in the time required for reading it backwards and reading it forwards.

During the same year in which Cattell made these determinations, Grashey¹ published a paper, based upon a study of aphasia, in which he maintained that the unit of perception in reading was the letter and not the word. This position was adopted by Wernicke, Leube and other alienists. Loewenfeld,² six years later, basing his conclusions also upon aphasic observations, affirmed that with the practiced reader the operation was not literal but verbal. He supported this observation by experiments with blurred words, in which he found that when the words were familiar a considerable amount of blurring did not interfere with the perception, while quite the opposite obtained with unfamiliar words. Goldscheider and Mueller³ subjected this problem to an elaborate experimental treatment. They found the time of perception to be dependent (1) upon the number of elements, and (2) upon the uniformity of their arrangement. In the case of elements of different kinds, the type or plan of arrangement was much more easily perceived than the separate characteristics of the single elements. In the exposure of letters which did not form words, the following results were obtained. (1) Four letters were correctly perceived upon the first exposure; (2) five letters were always correctly seen upon the second exposure. As regards letter-series forming syllables, words, and word-groups, it was found that series of four letters were correctly read at the first exposure; more than four letters were not successfully read at the first exposure, unless they were quite familiar. If the entire word is not perceived, there is a tendency to fill out the perceived letters into any word that may contain them. In words of eight letters or more, more than one exposure is invariably required. While only eight letters can be perceived in .03 sec., three words that make connected 'thought' can be correctly perceived in the same time. In actual reading, letters are either of 'determining' or of 'indifferent' significance for perception. To the former category belong in general the consonants and especially the initial letters. General conclusions: (1) In ordinary reading, there is no reason to believe that each letter is perceived as such. (2) For the production of the verbal (auditory-kinaesthetic) idea, and for the purposes of conceptual 'apperception,' the perception of the total number of letters uniting to form the word is not necessary, the perception of certain determining letters being sufficient for these purposes. (3) It is probable that the determining letters evoke the phonetic letter-sound images corresponding to them, and that these in turn evoke the complete verbal (auditory-kinaesthetic) image. (4) The word-image procedure in reading is not to be distinguished from 'literal' reading by the perception of 'determining' letters. The word-image is the succession of letter images.

¹ Grashey, H.: Ueber Aphasie und ihre Beziehung zur Wahrnehmung. Archiv für Psych. u. Nervenkrankheit, Vol. XVI. (1885.) pp. 654-689.

² Loewenfeld: Ueber zwei Fälle von amnestischer Aphasie, etc. Deutsche Zeitschrift für Nervenheilkunde, Vol. II. I Heft.

³ Goldscheider, A., und Mueller, R. F.: Zur Psychologie und Pathologie des Lesens. Zeitsch. für klinische Medicin, Vol. XXIII, pp. 130-167.

'Reading in word-images' is, therefore, in reality a reading in letter groups.

Pillsbury's problem¹ was in many respects closely related to that of Goldscheider and Mueller. He attempted to determine the "relative importance of sensation and the more general and remote factors which are involved in the very simple and familiar operation of reading a word." The method employed was the mutilation of type-written words by omitting, blurring and substituting letters. Results: (1) The various kinds of changes made in the words stand in ease of recognition in the following order: omitted, substituted, blurred. (2) A disfigurement of the first letter is easily recognized, but disfigurements coming later are apt to be overlooked. (3) Where more than one letter is disfigured the first disfigurement is not so often overlooked as are the others. (4) There is about as much chance of recognizing a misprint when it stands alone as when others are combined with it in the same word; if there is any difference, it is in favor of recognizing a change when others are present. (5) The strength of suggestion which comes from the word itself is entirely independent of the length of the word. (6) The proportion of misprints overlooked is greatly increased under the influence of the suggestion of associated words.

Erdmann and Dodge² consider Goldscheider and Mueller's results untenable. (1) Words are optical wholes, but the spoken reproductions are letter combinations. (2) If a printed line (the context of which may be readily understood) is read, and the head meantime kept in an immovable position, there is a regular alternation between the pauses of rest and the eye movements. The number of movements is much smaller in reading the mother-tongue than in reading a foreign language; and the more familiar the context, the more uniform are the durations of the rest-pauses and the movements. (3) The number of rest-pauses and movements is three times as great when the reader attends to the text itself as when he attends to the contents of this text. (4) When the attention is directed upon the text, rather than the contents, the field of most distinct vision includes about four letters (p. 68). (5) The rapid alternation of the black and white text-elements following one another during the eye-movements completely excludes the possibility that we cognize the letters in the course of such movements (p. 71). During the course of the eye-movement in reading there is lacking a perceptive contents corresponding to the actual stimuli presented by the letters, if, as is ordinarily the case, the attention is not directed to this perceptive contents. (6) Visual perception of the letters in reading occurs exclusively during the rest-pauses of the eye; these can, therefore, be designated reading-pauses. The areas of simultaneous perception in reading are greater than the areas of distinct perception of the single letters, and the range of these reading-areas excludes the possibility that all single letters contained in them are distinctly perceived. The sum total of the visual angles subtended while reading a line is smaller than the visual angle for the entire line. (7) Under similar conditions, four to five times as many letters can be read in word-connection as without word-connection. In the reading of letters exposed without word-connection, the last to be exposed are generally either not read at all or falsely read. (8) The fact that we perceive familiar words under conditions that exclude any perception of the single elements is due to the typical forms which the words

¹ Pillsbury, W. B.: The Reading of Words. This *Journal*, Vol. VII, pp. 315 ff.

² Erdmann, B., and Dodge, R.: *Psychologische Untersuchungen ueber das Lesen auf experimenteller Grundlage*. Halle, 1898.

possess under these conditions; just because the single *letters* are perceptive units only through the arrangements of their component parts, the verbal perception must be dependent upon the type-form that is peculiar to the *word* as an unit of visual perception. (9) The simultaneous perception of short sentences, parts of which are seen only very indistinctly in indirect vision, must involve the co-operation of contextual connections in meaning which render the 'understanding' of the sentence possible. It is, however, not this contextual connection, but the type-form of the word, that gives in general the deciding conditions (p. 175). (10) The spoken and heard words are successive wholes, while the visual word is a simultaneous whole. The spoken word is only imperfectly symbolized by the visual word (p. 191). The spoken word is a whole only in the combination of its acoustic and kinaesthetic sensations.

Quantz¹ found that colors are more easily perceived than geometrical forms, isolated words than colors, and words in connection than disconnected words.

Huey² found that the speed in reading aloud is correlated with the 'sense' made. 'Sense' passages are read in a little more than half the time taken for nonsense passages of an equal number of letters. "The pronunciation of an adjective . . . seems to subexcite association tracts representing substantives,—preferably and more strongly substantives with which the particular adjective has been most often associated. . . . The right word is ready to leap out at the slightest suggestion from the printed page, if that passage makes sense." The last part of a word is less essential to the perception of the word than the first part. This may be due (1) to the tendency of the English language to accent the first part of the word, the accented part thus tending to represent the word, or at least, the spoken word; (2) to the preponderance of suffixes over prefixes, the main root of the word being in the first part, and rendering the first part more important. Huey concludes that the theory of letter perception in reading is untenable.³

Above all else, this work upon visual perception bears overwhelming testimony to the significance which 'context' has for the perception of symbols which appeal to the eye. It was the primary object of the present study to determine whether a similar condition obtains in the case of symbols appealing to the ear. The experimental consideration of this question furnished material for further study along related lines, so that the final formulation of our problem included three distinct divisions: the primary question (a) What is the effect of 'context' upon the perception of auditory symbols, or, in other words, how are the objective elements of auditory symbolism related to the subjective or central elements?—and two subsidiary questions: (b) How are the objective elements related to one another? and (c) What are the conscious processes involved in the apperception of the spoken sentence?

¹Quantz, J. O.: Problems in the Psychology of Reading. *Psychological Review*, Monograph Supplement, Vol. II, No. 1, 1897.

²Huey, E. B.: *This Journal*, Vol. IX, pp. 574 ff.; Vol XI, pp. 283 ff.

³For a more detailed analysis of the earlier literature dealing with the problems of word and sentence perception, see Erdmann and Dodge, *op. cit.*, pp. 7-30.

II.

EXPERIMENTS.

(A) THE PERCEPTION OF AUDITORY SYMBOLS: (1) The Relation of the Objective to the Subjective Factors of Auditory Symbolism; (2) The Relation of the Objective Factors to One Another.

§ I. *Method and Apparatus.* The method employed in the first two determinations was based upon the psychophysical principles we have already laid down. A word is normally a definite complex of various sounds which we call consonants and vowels. As we have seen, the consonantal variations are modal changes conditioned by the different forms of adjustment and release of the vocal organs. The vowel variations are qualitative modifications of the laryngeal clangs. A consonant always involves a vowel; hence, if we vary the consonants, we also vary the vowels. Our method involved the elision of consonants, and a determination of the accompanying effect of the word upon the observer. In order to determine the relation of the psychophysical factors to the central factors (the first and primary problem), (a) mutilated words were given without context, (b) mutilated words were given with a minimum of context, *i. e.*, with one or two related words, (c) mutilated words were placed at the beginning of complete sentences, (d) mutilated words were placed in the middle of complete sentences, and (e) mutilated words were placed at the end of complete sentences. In order to determine the value of the symbolic elements as compared with one another, *i. e.*, the relation of the objective factors to one another (the second problem), the effects of the various forms of mutilation upon the perception of the word by the observer were compared. In this case the words were used with and without context, the temporal conditions being varied by eliding consonants (a) at the beginning of the word, (b) in the middle of the word, (c) at the end of the word.

The words thus mutilated were divided into the following categories:

I. Initial consonant omitted. Class A.

II. Mid-consonant omitted. Class B.

(1) The consonant standing alone between two vowels.

(2) The consonant standing next to another consonant,—so, *i. e.*, that a voiceless hiatus should not be left between the vowels upon elision.

III. Final consonants omitted. Class C.

These words were placed in short, complete and categorical sentences, which were classified as follows:

I. Sentences in which the mutilated word is at or near the beginning. Class *a*.

II. Sentences in which the mutilated word is in the middle. Class *b*.

III. Sentences in which the mutilated word is at the end. Class *c*.

There were thus possible the following series of sentences :

Aa. Initial consonant omitted at the beginning of the sentence.

Ab. Initial consonant omitted in the middle of the sentence.

Ac. Initial consonant omitted at the end of the sentence.

Ba. Mid-consonant omitted at the beginning of the sentence.

Bb. Mid-consonant omitted in the middle of the sentence.

Bc. Mid-consonant omitted at the end of the sentence.

Ca. Final consonant omitted at the beginning of the sentence.

Cb. Final consonant omitted in the middle of the sentence.

Cc. Final consonant omitted at the end of the sentence.

Of these possible combinations, the following were selected as answering every demand of the experiment :

Aa, Ac, Ba, Bc, Cb, Cc.

It was attempted to make every series complete, *i. e.*, to represent every consonant in every series. For purposes of convenience a classification of consonants, following in the main that of Whitney,¹ was tentatively adopted :

	Semi-vowels.	Aspirates.	Nasals.	Sibilants.	Spirants.	Mutes.
Labials	w		m		v, f	b, p
Linguals	r, l		n	z, s	th, ch, j	b, t
Palatals	y	h	ng	zh, sh		g, k

It was also attempted to combine every consonant with every vowel ; *i. e.*, to represent each consonant in every series by as many different words as there are different vowel sounds. When this could not be done, different words were added in which the consonant in question was preceded or followed by a vowel already in use in another word.

The following complete series (Bc) is inserted as an example :

1. As a companion he was extremely a(m)iable.
2. The howling wind set the windows rattling and the doors sla(mm)ing.
3. The religious spirit is predominantly e(m)otional.
4. It is often hard to reduce a compound to its ele(m)ents.
5. A light on the distant shore was gli(mm)ering.
6. As a boy, the poet was forever rhy(m)ing.
7. He would have loosened the knot in another mo(m)ent.
8. The governor refused a new no(m)ination.
9. He pointed toward where the mountain was loo(m)ing.
10. The greatest life cannot be wrecked by calu(mn)y.
11. The most exasperating being on earth is a coquettish wo(m)an.
12. Of all that little band of men he was the bra(v)est.
13. It was a mystery that none of us could unra(v)el.

¹ Whitney, W. D.: Life and Growth of Language. N. Y., 1885-1897, p. 62.

14. It was admitted to be a glorious achie(ve)ment.
15. He did not deny the possibility of divine re(v)elation.
16. Amusement was furnished in great di(v)ersity.
17. Every man possesses an element of the di(v)ine.
18. He stopped to take breath when he reached the ri(v)er.
19. It was rumored that the war was o(v)er.
20. We knew that he could not reco(v)er.
21. The circuitous route is the sa(f)er.
22. When we saw her she was lau(gh)ing.
23. The captain wore a heavy ree(f)er.
24. I had never seen him be(f)ore.
25. The concussion was dea(f)ening.
26. He was known as an ignorant sco(ff)er.
27. It is wrong that the innocent should su(ff)er.
28. Gluttony is an euphemism for stu(ff)ing.
29. He loved all animate things except ba(b)ies.
30. The word was not in the voca(b)ulary.
31. I had often witnessed the scene he had just been descri(b)ing.
32. He was held for murder and ro(bb)ery.
33. The ring was set with ru(b)ies.
34. The floor needed a good scru(bb)ing.
35. His painting might better have been called dau(b)ing.
36. As a mechanic he was extremely ca(p)able.
37. One cannot deny that the office-holders are ra(p)acious.
38. No one doubts the moral efficacy of re(p)entance.
39. The flocks were watched by she(p)herds.
40. The wire was quickly cut with a pair of ni(pp)ers.
41. Some one cut the rope he was gri(pp)ing.
42. The bank was slo(p)ing.
43. I caught the words he was dro(pp)ing.
44. It was the work of the little god Cu(p)id.
45. Blame no man for his stu(p)idity.
46. The structure was simply stu(p)endous.
47. His position on the question was a(n)omalous.
48. The panic was ge(n)eral.
49. He had lost everything except his ho(n)or.
50. The ship could be located by the smoke from her fu(nn)els.
51. The hedge needed pru(n)ing.
52. Such a contingency was extremely fortu(n)ate.
53. I could see that he was frow(n)ing.
54. The results were most ama(z)ing.
55. The water in the pipes was free(z)ing.
56. There was some question as to the re(s)ults.
57. One must act quickly and without he(s)itation.
58. She did not like ro(s)es.
59. He was unable to maintain his po(s)ition.
60. He left the game when he found that he was lo(s)ing.
61. He had left word that he would be extremely bu(s)y.
62. Are you acquainted with that ponderous tome which he is peru-
(s)ing?
63. The yacht was intended for ra(c)ing.
64. The book was put a(s)ide.
65. The degenerate is marked by his a(s)ymmetry.
66. His time was spent in re(s)earch.
67. We made the preparation according to the re(c)ipe.
68. We were to travel through Europe on bi(c)ycles.
69. The empire included all Chri(st)endom.
70. He was a victim of hallu(c)inations.

71. We do not think that the combination is po(ss)ible.
72. The situation was highly amu(s)ing.
73. He was not aware of the storm he was arou(s)ing.
74. The problem of natural science is the interpretation of na(t)ure.
75. Contagious diseases are those which are called ca(tch)ing.
76. The reverend gentleman was a popular prea(ch)er.
77. On the wall hung a painting and two e(tch)ings.
78. For conquest he had a strange i(tch)ing.
79. We did not see the train approa(ch)ing.
80. The beef trust is hard on the bu(tch)er.
81. By his side the dog was crou(ch)ing.
82. Diseased tissues are studied by the pa(th)ologist.
83. War clouds are ga(th)ering.
84. He went into business with his fa(th)er.
85. Good speaking depends on good brea(th)ing.
86. The horses wait wi(th)out.
87. He had been shot through the head and lay on the ground
wri(th)ing.
88. Many of the soldiers were without proper clo(th)ing.
89. It was not the difficulty that bo(th)ered.
90. The loss was next to no(th)ing.
91. The fire was almost smo(th)ered.
92. His death must be reported to the au(th)orities.
93. The illumination is ra(d)iant.
94. The pain was almost ma(dd)ening.
95. The statement is utterly incre(d)ible.
96. The train was backed upon a si(d)ing.
97. The men had left the car they were loa(d)ing.
98. The lawn needed so(dd)ing.
99. I saw the book which he stu(d)ied.[‡]
100. They did not know the trouble over which he was broo(d)ing.
101. He was evicted as an intru(d)er.
102. He was seen in Paris ten days la(t)er.
103. The governor refuses to discuss the ma(tt)er.
104. On his part the attitude was confessedly a pre(t)ense.
105. We counted on the rose five pe(t)als.
106. He is a good wri(t)er.
107. The leaders admitted that they could not meet the extremi(t)y.
108. We were to have gone boa(t)ing.
109. The tree is swaying and to(tt)ering.
110. The crowd was jeering and hoo(t)ing.
111. A man must earn his bread and bu(tt)er.
112. She was divinely beau(t)iful.
113. The project has been extensively exploi(t)ed.
114. The army was completely rou(t)ed.
115. The window was reset by a gla(z)ier.
116. The color of the sky was a(z)ure.
117. We do not get much lei(s)ure.
118. One does not live for plea(s)ure.
119. We waited within the enclo(s)ure.
120. The Poggendorf figure is an optical illu(si)on.
121. He did not welcome our intru(s)ion.
122. The matter interests the entire na(ti)on.
123. His pleading was fiery and pa(ssi)onate.
124. Several connoisseurs expressed their appre(c)iation.
125. We have already signed the peti(ti)on.
126. The life we lead is not real but facti(ti)ous.
127. Before us stretched the expanse of the o(ce)an.

128. The ballot is not free from pollu(ti)on.
129. The moment was cru(ci)al.
130. We were almost stunned by the concu(ssi)on.
131. Proceed along the path with cau(ti)on.
132. The most entrancing theories are the va(gu)est.
133. We had experienced the awful a(g)ony.
134. The king knew that his courtiers were intri(gu)ing.
135. He had killed lions and bears and ti(g)ers.
136. The army was made up of volunteers and re(g)ulars.
137. The lad had climbed into the ri(gg)ing.
138. The children were ro(gu)ish.
139. The ant tendered a reception to the slu(gg)ard.
140. The play was characterized by its unique sta(g)ing.
141. The affair is too horrible to ima(g)ine.
142. The criminal presented many marks of de(g)eneration.
143. The strips were used for e(dg)ing.
144. We found him most obli(g)ing.
145. He was not dogmatic in his reli(gi)on.
146. The term 'education' is preferred to 'pedago(g)y.'
147. We did not see him at his lo(dg)ing.
148. Industry without art is dru(dg)ery.
149. He was a notorious pu(g)ilist.
150. We bought bread of the ba(k)er.
151. The enterprise did not lack ba(ck)ers.
152. Death is followed by de(c)ay.
153. We are at the end of a de(c)ade.
154. Eric was one of the Vi(k)ings.
155. The fires are fed by an automatic sto(k)er.
156. There was plenty of food in the lo(ck)ers.
157. He got a good du(ck)ing.
158. I do not like him any lo(ng)er.
159. We heard that she was a good si(ng)er.
160. The evening chimes were ri(ng)ing.
161. The man was leaning over the rai(l)ing.
162. We had visited the pa(l)ace.
163. I did not know his fee(l)ing.
164. The missionary was most zea(l)ous.
165. It is called latter-day Phi(l)istinism.
166. All sciences have grown out of phi(l)osophy.
167. The people are not civi(l)ized.
168. We took our exercise by bow(l)ing.
169. The coat had a velvet co(l)ar.
170. He chided him for his foo(l)ishness.
171. The procedure was acknowledged to be irregu(l)ar.
172. He is blind to certain co(l)ors.
173. The disaster is appa(l)ing.
174. The water is improved by boi(l)ing.
175. The wind was how(l)ing.
176. The law is subject to many va(r)iations.
177. I have not a word against his private cha(r)acter.
178. We were among her admi(r)ers.
179. The procedure was most i(rr)egular.
180. Do not always look for the mo(r)al.
181. They came away much poo(r)er.
182. His hesitancy is natu(r)al.
183. Mrs. Smith was to do the pou(r)ing.

Theoretically, the sentences numbered in all 1085, but owing to the difficulty encountered in finding words for all classes, as

well to imperfections in the records, only 850 sentences were used.

The words and sentences were recorded upon the cylinders of an Edison phonograph¹ (Class M). Care was taken to speak the words distinctly, but in general the emphasis and inflection were those of ordinary conversation. All the words and sentences were recorded by one person (the author). The time of the revolution of the cylinder was constant both in making the records and in making experimental tests (160 revolutions per minute, verified at the beginning of each experimental hour).

The mutilated words were first placed alone upon one set of cylinders, words of the different classes,—A, B and C—being recorded together to eliminate possible errors of expectation. The observers were instructed to listen to the word as reproduced by the phonograph, and to repeat it to the operator, who recorded the judgment. Occasional un mutilated words were inserted as checks.

The sentences were recorded upon a second set of cylinders, care being taken to mix the various classes as in the case of words. The observer was instructed to listen to the sentence as reproduced, and to repeat it to the operator, who recorded it as given by the observer, noting at the same time the errors made in the perception of the separate words.

For one series of the single mutilated words, the procedure was as follows: Two seconds before the word was reproduced by the phonograph, the operator spoke two words which stood in the relation of context to the mutilated word. The observer's reactions upon the word, both with context and without context, were recorded.

It will be noted that this method is practically that which Pillsbury² used in his experiments upon the reading of words, with the exception that our own method is complicated by the use of the sentence as context. Indeed, the aim of this part of our problem was, primarily, to do for the spoken word what Pillsbury had done for the printed word.

The experiments extended through two academic years (1898-99, 1899-1900), tests being made only during the morning hours.

§ 2. *Observers.* For the first two experiments on the perception of auditory symbols, the following eight members of the Department of Psychology, Cornell University, volunteered to act as observers: Dr. J. O. Quantz, Dr. G. A. Cogs-

¹A discussion of the applications of the phonograph to psychological work will be found in *Les Phonographes et l'Étude des Vowelles*, by Dr. Marage, in *L'Année Psychologique*, 1898, pp. 226 ff.

²Pillsbury: *op. cit.*, p. 341.

well, Dr. G. M. Whipple, Dr. W. B. Lane, Miss F. M. Winger, Miss J. A. Cochran, Mr. H. O. Cook, and Mr. R. M. Ogden. While the nature of the experiment necessitated a certain amount of knowledge on the part of the observers regarding the work in hand, the special object of the tests was unfamiliar to them, and the general procedure may be designated as 'without knowledge.'

It will be readily seen that the use of every possible combination as given above (p. 88) would introduce into the experiment a source of error which must, as far as possible, be avoided. The words were first given alone, and then repeated once or twice with a contextual connection. By permitting a relatively long interval of time—two to four months—to elapse between each repetition of the word in the various connections, the recognition of the word as having occurred in a previous test happened very infrequently. Had every combination been used for each word, such a procedure would have been quite impossible.

§ 3. *Results and Conclusions.*

PROBLEM I. THE INFLUENCE OF CONTEXT UPON THE PERCEPTION OF AUDITORY SYMBOLS.

In this connection we have to compare the results of giving mutilated words alone, of giving them with a minimum of context, of giving them at the beginning of complete sentences, of giving them in the middle of such sentences, and of giving them at the end of such sentences.

(a) *Words Given Without Context.*

Table I shows the percentage of mutilated words correctly perceived when given without context. The letters A, B and C refer to the place in the word at which the elision was made—A, initial consonant elided; B, mid-consonant elided; C, final consonant elided.

TABLE I.

Class.	Total No. Judgments.	Right.	Wrong.	Perc't R't.
A	260	9	251	3.5
B	450	189	261	42.0
C	260	34	226	13.0
Totals,	970	232	738	23.9

The relatively high number of right judgments in the B-series is probably due, in large measure, to the fact that where the mid-consonants are omitted the words are predominantly polysyllabic. The A and C series were entirely monosyllabic. With this difference, the B-series should, of course, be left out of any comparison. The following conclusion seems to follow from the Table :

1. *In monosyllabic words the elision of the initial consonant affects perception more than the elision of the final consonant.*

This conclusion is in substantial agreement with Pillsbury's results for printed words : " A disfigurement of the first letter was easily recognized, since there was but slight expectation of what was to come."¹ The fact also suggests Goldscheider and Mueller's conclusion that the initial letters are among the predominantly 'determining' elements in reading,² as well as Huey's conclusion regarding the importance of the first part of the word in perception.³ The fundamental rôle which the initial consonants play in the genesis of speech is illustrated by the fact that the first consonants which the child uses are initial, and that only initial consonants are used for some time.⁴

(b) *Words Given with a Minimum of Context.*

The words used in this determination were chosen from the B-series. A complete record of one observer is given below.

Mutilated Word.	Context.	Observers' Report.	
		Word Alone.	With Context.
A			
A(m)iable	friend, cherished	a(m)iable	amiable
Sla(mm)ing	doors, childhood	slatting	slammed
E(m)otional	{ elements, determine	e(m)otional	e(m)otional
Gli(mm)ering	guided, light	query	twinkling
Ele(m)ents	water, hydrogen	{ eloquence, elegant	} ele(m)ents
Rhy(m)ing	{ adolescence, instinct	} riding	rising
Mo(m)ent	caught, flies	owen	woman
No(m)ination	his, assured	darnation	nomination
Loo(m)ing	{ up, Mt. Washington	} bluing	loo(m)ing
Calu(mn)y	him, heaped	calumny	calumny
Wo(m)an	bundle, foibles	one	one
Bra(v)est	men, fear	brayers	brave
Ca(v)il	{ calumny, unscathed	} hal	cavil
Achie(ve)ment	little, criticism	achie(v)ement	achievement
Re(v)elation	{ universe, interpreted	} revelation	revelation
Di(v)ersity	{ interest, friendship	} diversity	diversity
Di(v)ine	{ interference, human	} decline	divine
O(v)er	divide, land	or	war

¹ Pillsbury : *op. cit.*, p. 350.

² Goldscheider and Mueller : *op. cit.*, p. 160.

³ Huey : *This Journal*. Vol. IX, p. 581.

⁴ Tracy : *The Psychology of Childhood*, p. 127.

Mutilated Word.	Context.	Observers' Report.	
		Word Alone.	With Context.
No(v)el	force, life	now	{ doll, shall }
Pro(v)ing	error, process	{ cooing cooling }	} accruing
Lo(v)able	women, courtesy	{ gavel garbel }	} lovable
Lau(gh)ing	leads, obesity	thine	laughing
Be(f)ore	honor, effort	the oar	before
Dea(f)ening	roar, disaster	dea(f)ening	deafening
Li(fe)like	picture, praise	{ lie-like li(fe)like }	} lifelike
O(ft)entimes	wander, alone	{ on time autumn-time }	{ olden times on time }
Stu(ff)ing	{ animals, taxidermy }	starting	stuffing
Ba(b)ies	{ bachelor's, bugbears }	baize	bays
Voca(b)ulary	important, book	voca(b)ulary	voca(b)ulary
Descri(b)ing	{ personal, adventures }	descriing	describing
Scri(bb)ling	verse, genius	shrilly	squirling
No(b)ler	men, better	nola	older
Ro(bb)ing	genteel, vocation	drawing	calling
Ru(b)ies	{ diamonds, precious }	Ruiz	Ruiz
Scru(bb)ing	floor, artistic	scrawling	scru(bb)ing
Ca(p)able	better, things	ca-able	capable
Ra(p)acious	{ politicians, monopolized }	veracious	veracious
Re(p)entance	{ itself, constructive }	{ prentice, pre-empted }	} the entrance
She(ph)erds	flocks, night	charades	charade
Gri(pp)ing	man, throat	spearing	grinning
Slo(p)ing	walls, ascent	flowing	flowing
Dro(pp)ing	wall, escape	drawing	drawing
Stu(p)endous	gorge, wonder	stu(p)endous	stu(p)endous
Cu(p)id	life, part	Hewet	stupid
A(n)omalous	{ position, comment }	anomalous	anomalous
Ge(n)eral	disaster, panic	Jerrold	Jerrold
A(n)yone	done, better	a-one	A-l
Pho(n)ographs	products, decade	phonographs	phonographs
Ho(n)or	before, effort	all	awe
Croo(n)ing	scandalous, tales	accruing	accruing
Combi(n)ations	{ capital, dangerous }	combinations	combinations
Su(pp)osing	true, result	supposing	supposing
Fortu(n)ately	well, armed	fortunately	fortunately
Fu(nn)els	clouds, smoke	false	funnels
Cra(z)y	stories, believed	cra(z)y	crazy
Re(s)ults	{ whatever, interesting }	real	real
He(s)itation	critical, failure	citation	hesitation
Civi(l)ized	nations, war	civilized	civilized
Ro(s)es	violets, grown	rose	rose
U(s)ing	gun, club	hewing	hewing

In all, 358 judgments were recorded; 183 with context and 175 without context. Table II shows the percentage of correct perception for both classes.

TABLE II.

	Without Context.	With Context.
Total Judgments,	175	183
Right Judgments,	50	96
Wrong Judgments,	125	87
Per cent. Right,	28.5	52.4

Lest the 28.5% of this last determination may be thought inconsistent with the 42.0% of Table I, it will be well to explain that the words chosen for the test represent only those members of the B-series which were the most difficult to perceive after mutilation. The following conclusions seem warranted:

2. *When mutilated words are given with a minimum of context, the chances for their correct perception are increased by 82% as compared with their chances of correct perception when given without context.*

3. *The fact of mutilation is readily noticed in the single words given without context, even though the word be finally correctly perceived; the elision is not so readily noted when the word is given with a minimum of context.*

These conclusions are again in full agreement with Pillsbury's results for the visual word.¹

(c) *Words given at or near the Beginning of Complete Sentences.*

Two of the sentence series—A and B—furnished the data for this determination. Tables III and IV give the results.

TABLE III. SERIES AA.

	Given Alone.	At the Beginning of Sentence.
Total Judgments,	260	390
Right Cases,	9	288
Wrong Cases,	251	102
Per cent. Right,	3.5	73.8

Here the A-words have leaped, by the influence of context, from 3.5% of correct perceptions, when given alone, to 73.8% of correct perceptions, when placed at the beginning of a complete sentence. The B-words have increased much less rapidly, as the following Table shows.

¹ Pillsbury: *op. cit.*, p. 361.

TABLE IV. BA SERIES.

	Given Alone.	At the Beginning of Sentence.
Total Judgments,	450	944
Right Judgments,	189	557
Wrong Judgments,	261	387
Per cent. Right,	42	59

The following conclusions are to be drawn:

4. *Polysyllabic words when mutilated are more easily recognized than monosyllabic words under the same conditions, but, when given in context, are not helped by the context as much as are the monosyllabic words.*

5. *When mutilated words are placed at or near the beginning of complete sentences, the chances for their correct perception are increased remarkably, the amount of increase varying with the character of the word, being greater for monosyllables and less for polysyllables.*

(d) *Words placed in the Middle of Sentences.*

Only one of the sentence-series—Cb—was used in this determination. The C-words were all monosyllables; hence, the results of this determination are comparable with the Aa series of Determination 'c.' Table V gives the results.

TABLE V. THE CB SERIES.

	Word Given Alone.	Given in Middle of Sentence.
Total Judgments,	260	498
Right Judgments,	34	399
Wrong Judgments,	226	99
Per cent. Right,	13.0	80.1

Here we find a distinct gain in correct perception over the last determination. In comparing this series with series Aa of Determination 'c,' the objection may be raised that the C series has already been proven more easily perceived than the A series, and that, therefore, the gain from 73.8% (the result of the Aa series of Determination 'c') loses its significance. When, however, we take into account the long leap that both series make when given the advantage of context, this difficulty does not appear so great as at first sight. The following conclusions seem to be justified:

6. *When mutilated words are placed in the middle of complete sentences, there is a slight but significant increase in the percentage of correct perceptions as compared with the perceptions of the similar words placed at the beginning of complete sentences.*

7. *When mutilated words are placed in the middle of complete sentences, they are much more amenable to correct interpretation than when given without context.*

(e) *Words given at the End of Complete Sentences.*

Series Ac, Bc, and Cc are represented in this determination. The results are shown in Tables VI, VII and VIII.

TABLE VI. THE AC SERIES.

	Given Alone.	Beginning of Sentence.	End of Sentence.
Total Judgments,	260	390	114
Right Judgments,	9	288	100
Wrong Judgments,	251	102	14
	<hr/>	<hr/>	<hr/>
Per cent. Right,	3.5	73.8	87.7

TABLE VII. THE BC SERIES.

	Given Alone.	Beginning of Sentence.	End of Sentence.
Total Judgments,	450	944	507
Right Judgments,	189	556	408
Wrong Judgments,	261	387	99
	<hr/>	<hr/>	<hr/>
Per cent. Right,	42	59	80.4

TABLE VIII. THE CC SERIES.

	Given Alone.	Middle of Sentence.	End of Sentence.
Total Judgments,	260	498	404
Right Judgments,	34	399	366
Wrong Judgments,	226	99	38
	<hr/>	<hr/>	<hr/>
Per cent. Right,	13.0	80.1	90.5

The conclusion follows :

8. *The position most favorable for the correct perception of a mutilated word is at the close of a complete sentence.*

Table VII shows the general relations of all the classes.

TABLE VIII. GENERAL RELATIONS.

Min. Con.=Minimum Context. T=Total Judgments. R=Right Judgments.										
Class.	Alone.		Min. Con.		'a'		'b'		'c'	
	T	R	T	R	T	R	T	R	T	R
A	260	9			390	288			114	100
B	450	189	183	96	944	556			507	408
C	260	34					498	399	404	366
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	970	232	183	96	1334	844	498	399	1025	874
	<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
P. c'nt. R't,	23.9		52.4		63.2		80.1		85.2	

9. *The temporal position of a mutilated word in the succession of contextual elements with which it is given, determines the amount of injury which the word as an unit of auditory perception sustains through mutilation.*

PROBLEM II. THE RELATIONS OF THE SYMBOLIC ELEMENTS TO ONE ANOTHER IN AUDITORY PERCEPTION.

Have the various consonants, or classes of consonants, varying degrees of significance for perception? Are there among the auditory symbol elements certain elements which are 'determining' and certain others which are 'indifferent,' as Goldscheider and Mueller maintain to be the case in visual symbol elements? We have already found that the *position* of an element is a determining factor in perception. This, however, can be interpreted as analogous to the influence of context; for since the initial element possesses the greatest significance for perception, it is reasonable to suppose that the mid and final elements lose significance through the associative supplementing of the preceding elements. The question now arises: apart from this associative supplementing, are there other objective or physiological factors which give the various elements a varying degree of significance? Are certain consonants, either because of the ease with which they are produced or by reason of their peculiar quality, more fundamental than other consonants?

The word-series B was used in this experiment, the general object being to determine what consonants could be elided with the least injury to the perception of the word. Table IX gives the results. The percentages represent all the judgments made upon the mutilated words, whether with or without context, the assumption being that the context helped all classes of consonants impartially.

TABLE IX.

Injury Worked to Perception of Mutilated Word by Elision of Different Kinds of Consonants.

CONSONANT ELIDED.	TOTAL JUDGMENTS.	RIGHT.	WRONG.
Mutes.			
p	47	20	27
b	28	9	19
d	44	25	19
t	43	22	21
g	26	12	14
k	40	14	26
Totals,	228	102	126 44.7% Right.
Spirants.			
f	23	9	14
v	38	18	20
th	27	11	16
j	43	25	18
ch	29	13	16
Totals,	160	76	84 47.5% Right.

Sibilants.			
s	36	20	16
z	16	3	13
sh	42	21	21
zh	18	11	7
Totals,	112	55	57 49.1% Right.
Nasals.			
m	43	17	26
n	32	23	9
ng	9	2	7
Totals,	84	42	42 50.0% Right.
Semi-vowels.			
w	10	7	3
r	36	28	8
l	42	28	14
Totals,	88	63	25 71.6% Right.

10. *The elision of mutes works the greatest injury to the perception of a mutilated word; the elision of the semi-vowels works the least injury to such perception. Elision of spirants, sibilants and nasals works greater injury than the elision of semi-vowels, and less injury than the elision of mutes.*

We have in this instance a striking correlation with the facts of language development. In the phylogeny¹ and ontogeny² of speech the mutes are the first consonants to appear. They are also the easiest to form, involving the least complex musculature and the slightest delicacy of co-ordination.

11. *The consonants which are of the greatest significance in the auditory perception of words are those which involve in their production only the coarser articulatory combinations. They may, therefore, be considered as the more fundamental elements of auditory symbolism.*

These results may now be compared with the substitutions which the various observers made when the words were misperceived. The data of this determination are mostly such words as were *not* filled out by the observer into 'meaningful' but into nonsense symbol-complexes. Hence the substitutions made may well be considered as, in the main, those which followed the 'line of least resistance;' those, in other words, which required the least expenditure of energy for their production. Some examples are given below:

Word Given.	Word Reported.
sla(mm)ing	slatting
no(m)ination	notation

¹ Cf. Whitney : *Life and Growth of Language*, p. 68.

² Cf. Tracy : *Psychology of Childhood*, p. 127.

Word Given.	Word Reported.
fe(tch)ing	fetting
ga(th)ering	ackering
na(ti)on's	valiance
a(g)ony	arry
pu(g)ilist	purellas
du(ck)ing	dunning
mo(m)ent	oak cent
ca(v)il	cattle

TABLE X.

The Comparison of Multiple and Single Elements Appearing in the Substitutions.

	No. of Elements Represented.	No. of Substitutions.	Average for each Element
Single Elements,	22	221	10.
Multiple "	14	21	1.5

By 'multiple elements' are meant combinations of single consonants or digraphs.

12. *Multiple elements are substituted much less frequently than single elements; in the proportion of 15 to 95, or, approximately, 1:6.*

TABLE XI.

The Comparison of Different Classes of Single Elements Appearing in the Substitutions.

Total Number of Substitutions.....221									
Mutes.		Spirants.		Sibilants.		Nasals.		Semi-vowels.	
p	3	f	1	s	6	m	2	v	63
b	6	v	7	z	1	n	2	r	26
d	11	th	5	sh	4	ng	8	l	21
t.	26	j	3	zh	0			y	15
g	1	ch	2						
k	8								
Total,	55		18		11		12		125
Av. for each Mute, 9.1		Spiran, 3.6		Sibilants, 2.7		Nasals, 4		Semi-v'ls, 31.2	

The preponderance of semi-vowels substituted may seem remarkable in the light of the last determination, where we pointed out that the mutes are not only the 'easiest' elements to produce vocally, but also the most fundamental in the genesis of speech, while the semi-vowels are the hardest to acquire and the latest to develop, both phylogenetically and ontogenetically. But while they are the latest to develop, they are not, once mastered, the most difficult to use, but rather are among the easiest. In the practiced use of language, "each class (vowels and consonants) draws the other toward itself; the vowels become more consonantal, the consonants become more vocalic."¹ Hence, it might well be expected that the semi-vowels, standing as they do on the border line

¹ Whitney: *Life and Growth of Language*, p. 69.

between the voiced and the unvoiced elements, should appear most frequently in the substitutions of adult speakers. In view of this fact, the following conclusion seems to be justified:

13. *When different single elements are substituted for the elided elements in mutilated words, the semi-vowels are chosen most frequently, the proportion being approximately three semi-vowels to two substitutions from all other classes. When semi-vowels are not substituted, the mutes are chosen more frequently than either the sibilants or the nasals, in the proportion approximately of three mutes to one substitution from any one of the other classes except semi-vowels.*

B. THE CONSCIOUS PROCESS INVOLVED IN THE APPERCEPTION OF SPOKEN SYMBOLS.

§ 1. *Object.*

From the series of mutilated words that were given, now singly, now with a minimum of context, now at the beginning, now in the middle, and now at the end of a complete sentence, it is evident that the 'setting' of a word is the determining factor in its apperception. The problem that confronts us, therefore, is this: Given a complex of sounds, otherwise perceived simply as such a complex, what are the conscious processes by which this complex acquires 'meaning;' by which it is not merely perceived as sound, but apperceived as a 'meaningful' symbol?

Apperception is used in this connection to denote the reaction of experience upon new contents, or, as Pillsbury puts it, "apperception represents the influence of general experience in consciousness."¹

This connotation of the term apperception, now generally adopted, was vaguely suggested by Leibniz;² but it was the Herbartians who first gave it an important significance in psychological nomenclature. According to Herbart,³ a new idea is apperceived by an older idea or by a complex of older ideas. With Drobisch,⁴ the apperceiving idea becomes a distinct 'psychological subject.' There is a psychological subject corresponding to every characteristic attitude of the mind. Now we are teachers, now students, now members of a political community. In every case a special psychological subject presides over the mental life, and the nature and constitution of this subject determine the form in which the newly entering contents shall be received. Waitz⁵ introduces the doctrine of apperception by 'coenæsthesi-'

¹ Pillsbury: *op. cit.*, p. 388.

² Leibniz: *Philosophical Works* (Tr. Duncan). New Haven, 1890, pp. 219.

³ Herbart, J. F.: *Psychologie als Wissenschaft. Sämmtliche Werke* (Kehrbach's ed.), Langensalza, 1892. Bd. VI, pp. 140 ff.

⁴ Drobisch, M.: *Empirische Psychologie nach wissenschaftlicher Methode*. Leipzig, 1842, p. 135.

⁵ Waitz, T.: *Grundlegung der Psychologie*. See also Stout, *Mind*, Vol. XIV (1889), p. 366.

Coenæsthesi is the mental attitude, the 'common feeling,' which is produced by every form of stimulus. In other words, coenæsthesi is the resultant of experience. With Lazarus,¹ an apperception is joined to a perception in the act of assimilation. The apperception is thus conceived as a structural pattern of the mind. It is, however, an active agent, and its efficiency is due to the working-over which it has undergone throughout the course of experience. Steinthal² means by apperception all the psychical factors and activities which mediate a cognition. It is the movement of two ideas governed by the *Weltanschauung* of the subject,—the movement of two ideas for the production of a cognition. Stout³ includes under apperception such processes as understanding, interpreting, identifying, subsuming, etc. In all these processes, a presentation "acquires a certain significance for thought by connecting itself with some mental preformation as this has been organized in the course of previous experience." The process of apperception coincides substantially with that of attention. In the Herbartians, both the agents and the materials of apperception are ideas or idea complexes; in Stout, the materials of apperception are involved in the concept of mental 'systems.' A mental group or system is a systematized tendency, and the union of such groups or systems is the confluence of different modes of mental activity. (*Cf.* the 'psychological subject' of Drobisch.) Regarding the agent of apperception, Stout renounces the Herbartian concept of ideational activity, and considers apperception as a conative process. With Wundt,⁴ apperception is the process through which one idea becomes clear and distinct, while others remain vague and indefinite, the entire process being accompanied by a feeling of activity, by the inhibition of irrelevant ideas, and by other accessory phenomena.

The problems in a study of apperception are revealed more clearly if the dichotomy between a structural and a functional psychology, as proposed by Professor Titchener,⁵ is rigidly made and adhered to. Apperception is a *function* of the mind. It has its *structural* pattern, *i. e.*, there is a certain mental state or condition which the apperceiving consciousness uniformly takes, and this state or condition is called attention.⁶ In a study of apperception, then, we have to inquire, what structural elements or compounds of elements carry the function of apperception. In what proportions are sensational and affective elements present, under different conditions, in the apperceptive consciousness? The mind assimilates the new material which is presented to it in a form determined by the environment.

¹ Lazarus, M.: *Das Leben der Seele*. Berlin, 1878, pp. 251 ff.

² Steinthal, H.: *Einleitung in die Psychologie*, etc. Berlin, 1881, pp. 166-263.

³ Stout, G. F.: *Analytic Psychology*. London, 1806. Vol. II, pp. 110 ff.

⁴ Wundt, W.: *Grundzüge der physiologischen Psychologie*. Leipzig, 1893. Bd. II, pp. 274 ff.

⁵ Titchener, E. B.: *An Outline of Psychology*. New York, 1899, pp. 21 ff. The Postulates of a Structural Psychology, *Philosophical Review*, Vol. VII, 5. (Sept., 1898.)

⁶ *Cf.* Kuelpe, O.: *Outlines of Psychology* (Tr. Titchener). London, 1895, pp. 423 ff.

What are the conscious processes which, on the structural side, constitute this assimilation? What is it that determines the particular pattern of the given apperceptive consciousness? Why are such and such perceptions and ideas in the focus, and such and such perceptions and ideas in the fringe of consciousness? What is the nature, under the given conditions, of the elements which fall in the focus, and what is the nature, under the same conditions, of the elements which fall in the fringe? Is there any uniformity with which these several arrangements of mental 'stuff' occur? If there is, does it suggest, directly or indirectly, a general postulate upon which a psychology of function can build?

Viewing our own problem—the apperception of spoken symbols—from this standpoint, we have to ask: What is the character of the associative and recognitory processes that underlie the apperception of symbols? In terms of what sense-modalities are our symbols interpreted? What part do mood, affective tone, environment, past experience, and similar factors play in the interpretation?

§ 2. *Method.*

The method employed in this determination was that of introspective analysis. The sentences were the same as those used in the first two determinations; a sample series has been given above (p. 88). The procedure was, in brief, as follows. After the sentences had been reproduced by the phonograph and repeated by the observer, the latter was instructed: (1) to give an introspective account of the manner in which he came to fill out the mutilated word, providing that the mutilation was recognized; and (2) to add all possible information as to the character of the mental processes which went on during the apperception of the sentence, with especial regard to the pattern of the apperceptive consciousness,—the presence or absence of definite and tangible 'imagery,' the concomitant affective phenomena, kinaesthetic sensations, etc. The results of the experiment fall into two sections, corresponding to these two divisions of the problem.

§ 3. *Observers.*

The value of the introspective reports must depend in large measure upon the training and ability of the various observers. Of the four observers whose protocols embody such reports, three were professional psychologists of from four to six years' technical training and experience. The fourth was a student of two years' training in psychological method. All were very much alive to the value of accurate introspection, and could differentiate clearly between the psychological and the logical implications of the matter with which they dealt.

The following observers offered their services for this deter-

mination: Miss F. M. Winger (*W*), Fellow in Psychology; Miss J. A. Cochran (*C*), senior student in psychology; Dr. G. M. Whipple (*Wh*), Assistant in Psychology; and Dr. W. B. Lane (*L*), Honorary Fellow in Psychology,—all of Cornell University. *W* and *L* are predominantly visual in type; *C* is predominantly auditory; and *Wh* auditory-visual.

The experimental work began in October, 1899, and continued until June, 1900. The experimental hours were ten, eleven and twelve in the morning. No tests were taken in the afternoons. *Wh* gave one hour a week to the work, *L* and *C* two hours a week, and *W* three hours a week.

§ 4. *Results.*

(a) *The Interpretation of Mutilated Symbols: The Principle of Contextual Supplementing.*

We have seen that, when a mutilated word is given alone, the chances are that its meaning will be lost upon the hearer; but when it is given in context, the chances are that the elisions will be filled out and the word supplied in its correct form. When a word is spoken erroneously, but is correctly perceived by the hearer, the process by which the errors are filled out has been described as 'associative supplementing.'¹ It is obvious that this involves a certain form of apperception. The erroneous part of the spoken word is filled out immediately from the hearer's experience, and this is always an instance of simultaneous association. But when the word is recognized as mutilated, the correct form is provided in large part by the context, and is only at first suggested and later confirmed by the mutilated form. This process may be called 'contextual supplementing,' and is an instance, not of simultaneous, but of successive association.² The greater part of the elisions in our sentences were supplied in this way.

14. *The mutilated word given in context is not, as a rule, filled out at once by associative supplementing, but is changed into its correct form by a process of successive association which, inasmuch as it is dependent almost entirely upon the context, may be called contextual supplementing.*

Illustrations: "He sold his ho(me) for a mess of pottage." *Wh* first misinterpreted *ho(me)* as *hole*. He then "tried to think what Esau sold;" *birthright* came up by successive association, then *home* was readily supplied.

"The matter is a function of ti(me) and space." *L* misinterpreted *ti(me)* as *tide*, but the juxtaposition of *space* led to the substitution of *time*.

"Is it the man or the no(se) in Cyrano?" *C* supplied *nose* after *Cyrano* had been spelled for her.

¹Titchener: *op. cit.*, pp. 216 ff. See also Bawden, *A Study of Lapses*. pp. 41-44.

²Titchener: *op. cit.*, p. 216.

"Na(t)ure abhors a vacuum." *L* would not have supplied the *ch* sound in nature had he not heard *abhors*, which immediately suggested it.

"Ga(th)ering news was his trade." *C* perceived *ga(th)ering* as the nonsense word *ackering*. Very much later she supplied *gathering*, but was unable to analyze the process by which she had reached it.

"Wri(th)ing in pain, he called for help." *C* supplied *writhing* after apperceiving *pain*.

"Wi(th)out health, happiness is perhaps impossible." *Wh* misinterpreted *health* as *help*. He changed it to *health* upon the completion of the sentence.

"The ra(d)iant diamond is but a bit of carbon." *Wh* could make nothing out of *ra(d)iant*, but supplied *radiant* "simply because it was appropriate."

"Gree(d)ily he seized and ate the food." *C*, *W* and *Wh* misinterpreted *gree(d)ily* as *really*. *C* supplied *greedily* from the word *seized*, *Wh* and *W* from the general context.

"Incre(d)ible as the story may seem, it is true." *Wh* first took *incre(d)ible* as *in travel*. He substituted the correct form after *seem* or *true*.

"Ma(tt)er and force are in the province of the knowable." *Wh* filled out *matter* from the suggestion of *force* and *knowable*.

"Wri(t)ers of novels are legion in these days." *C* did not supply *writers* until she had apperceived *novels*.

"The a(z)ure of the sky was changed to gray." *Wh* supplied *azure* from *sky*; *C* substituted *azure* after *gray*.

"The cau(ti)on was timely." *Wh* misinterpreted *caution* as *column*. When asked for further associations, he said: "I noticed no mutilations. The sentence suggested the stereotyped phrase: 'The caution was timely.'"

"The slu(gg)ard should eat the fruits of his sloth." *L* first reported, "The Slav should eat the fruits of his Slav." This had a 'familiar feel' and suggested a scriptural text. *Sloth* was suggested by the experimenter as the last word, and *L* at once supplied *slug-gard*.

"Golf is an interesting ga(me)." *Golf* was misinterpreted by *L* as *gold*. *Golf* was substituted by the context, and confirmed by the sound.

"The siege was interrupted by a tru(ce)." *C* misinterpreted *tru(ce)* as *true*, but supplied *truce* after *siege*.

"The ruling of the court was null and voi(d)." *Wh* supplied the word *void* immediately from the familiarity of the phrase. (This was doubtless a case of simultaneous association.)

It will be noted that most of these contextual supplementings can be grouped under three of Aschaffenburg's¹ rubrics of successive associations. These comprise the first two classes of his 'internal' associations, (*Associationen nach Co-ordination* and *Associationen nach prädicativer Beziehung*) and one class of his 'external' associations (*sprachliche Reminiscenzen*). Probably the majority are of the last-named type.

(b) *The More General Factors in Sentence Apperception.*

In this determination the lack of an adequate method or

¹ Aschaffenburg, G.: Experimentelle Studien ueber Associationen. Kraepelin's *Psychologische Arbeiten*, Bd. I, H. 2 and 3 (1895), p. 231.

schema of classification rendered the task more difficult. We had nearly three thousand introspective reports in protocol upon the conscious processes involved in interpretation. Each of these reports was extremely individual in character, and just what value to ascribe to each was a matter of serious import. The plan finally adopted was as follows. The writer went through the protocols rapidly, noted the character of each introspection, and made a rough classification of the material, working from the points that seemed to him most salient. Then the protocols were more carefully examined, and each introspective unit was assigned to its proper class. In this way numerical comparisons of the various types of imagery employed, of the sensational and affective phenomena, and of subjective and objective references were made possible. At the same time the more typical and the more striking reports were recorded separately, and from these a few have been selected for citation. The following is the classification as it took final form.

TABLE XII.

References involving visual sense-elements :		
Ideal reproduction of a represented environment,	199	instances.
Visual imagery of particular objects reinforcing a general reference,	217	"
Visual reference to maps,	15	"
Visual reference to pictures,	35	"
Visual reference to books,	15	"
Visual reference to persons,	155	"
Total visual references,	636	"
References involving auditory sense-elements,	30	"
References involving kinaesthetic sense-elements,	26	"
References involving taste and smell elements,	4	"
References involving temperature sense-elements,	30	"
Verbal references :		
Purely verbal references,	218	"
Verbal completions and supplements,	61	"
References to literature, history, etc., predominantly verbal,	38	"
References involving schematic representations, largely verbal,	14	"
Particular words visualized, innervated or heard,	62	"
Verbal references to previous sentence,	13	"
Verbal references to contexts,	23	"
Peculiar lines of thought initiated, largely verbal,	13	"
Total verbal references,	532	"
References uniform with the various observers,	132	"
Constant supplements,	38	"
Indefinite, changing and obscure references :		
References showing a hesitation between alternatives,	16	"
Different references at different parts of the context,	2	"

References which change gradually as the context proceeds,	40 instances.
References which take a figurative meaning in its literal sense,	5 "
Contexts erroneously perceived and curiously interpreted,	96 "
References inconsistent with the context,	9 "
Total indefinite, changing and obscure references,	168
References indistinct or absent :	
Reference vague and unorganized,	48 "
Only the auditory experience of the sentence in consciousness,	16 "
Familiarity with the sentence precludes definite and distinct reference,	6 "
Peculiarity in the mechanism of the sentence makes the reference indistinct,	5 "
Indistinct reference coming very late,	9 "
Total indistinct or absent references,	84 "

15. *Under the conditions of our experiment, and with the observers tested, the apperception of auditory symbols involves the presence in consciousness of visual and verbal ideas mainly; i. e., the conscious 'stuff' of the auditory symbolic apperception is made up in large part of visual and verbal (visual-auditory-kinaesthetic) sense elements. The auditory and kinaesthetic elements (apart from the rôle which they play in the formation of the verbal idea)¹ seemingly form but a small part, and the temperature, taste, and smell elements a still smaller part, of this 'stuff.'*

16. *The most complete form which the visual sense elements take is that of an ideal reproduction, more or less faithful, of a typical environment as represented by the context. Such a reproduction is common only with visually-minded observers and under optimal conditions of attention. It is usually complicated with other sensible and affective elements, but in such cases the visual elements predominate and occupy the focus of attention.*

Illustrations: "Not a man ha[s]² had his vote refused him." *L* visualized a voting card and a polling station. The vote was upon the 'license' question. The consciousness of this last reference took the form of the word 'temperance' printed with a capital T. There was some excitement about the city which, in the ideal reproduction, took the form of noise memories. *W*h, on hearing the same sentence, visualized the interior of the town hall of his native city, where voting was going on.

"The dogs were held in lea[sh]." *L* pictured a hunt, with a number of horses, dogs, etc., in the foreground.

"The principal plants indigenous to America are the potato, tobacco

¹*Cf. Titchener: op cit., p. 208; Bawden: op cit., pp. 59-60; Raymond Dodge: Die motorischen Wortvorstellungen, pp. 2-3.*

²A letter enclosed in brackets [] or parentheses () is the elided letter of the sentence. Where the brackets are used the elision did not involve the misinterpretation of the word.

and mai[ze].” *W* visualized maize and potatoes growing and tobacco manufactured.

“The ship could be traced by the smoke from her fu(un)els.” *W* misinterpreted *fu(un)els* as *bows*. She reported the following situation: “The ship was on fire. I was on another ship at first, and could see the smoke coming over the horizon. Then I was on the burning ship watching the smoke coming from the bows.”

“The safe door closed with a sna[p], and the cashier was a helpless prisouer.” With this sentence *Wh* had a “vague visualization of a man standing in the middle of a bank office. The safe door was back of him. He was a tall man with a smooth face and a derby hat. He had a valise in his hand and appeared to be startled at something. He was the cashier.” In this case, as in many others which we shall cite later, the reference was not in every way consistent with the context. *Wh* remarked upon this inconsistency in the protocol.

“A balmy bree[ze] wafted us to the south.” *C*’s reference was not immediate, but followed some seconds after she had repeated the sentence. She visualized a river between two banks. “The river seemed very long.”

“Gree[d]ily he seized and ate the food.” *Wh* visualized a man eating with both hands.

“By goa[d]ing the oxen constantly, he managed to move slowly on.” After the sentence had been repeated, *Wh* referred it to a country road near Topsfield, Mass. He visualized a yoke of oxen and a driver. *W*, with the same sentence, visualized an ox-cart and a man walking beside the oxen.

“The peti(ti)on received some attention.” *L* misinterpreted *peti(ti)on* as *Acteon*, which he took to be a Greek name. The sentence referred to a man’s reception—a public reception to a famous man—which *L* visualized, together with a Greek audience which was applauding.

“He sleeps in a nameless gra[ve].” *Wh* visualized a soldier’s grave on the side of a hill against a background of pines.

“The seed was covered with a white fu(zz).” *L* interpreted this sentence as, “The seed was covered with a white fog.” He later supplied *sea* for *seed*, and with this he visualized the sea enveloped in fog and a steamer moving through it. The ideas *slow-speed* and *fog-signal* (modalities uncertain) were also present.

“The sermon was unconscionably lo[ng].” *W* visualized a “lot of people sitting and waiting for the end to come. It was very quiet.” She did not see the preacher.

“Ships were frequently wrecked upon the ree[f].” *L* visualized the open sea off the Manacles, and in it a ship partially submerged. This was supplemented by the verbal associate ‘Paris.’

“Schools of fish are found off the ba[r].” *C* visualized a stretch of sand, the yellowness being especially noticeable.

“(Sh)ot and shell were poured into the fort.” *L* interpreted this as “Bombs and shell.” He referred it visually to the naval manœuvres off Santiago. He visualized a “definite circular arrangement of ships in motion.” A schematized parabolic curve of a projectile, and a mass of white smoke were also imaged visually.

“[C]aves of great extent honeycomb the hills.” *Wh* visualized the side of a hill pitted with small holes.

“[K]een business men perceived the opportunity.” *Wh* associated this successively to the name of a leading business man of his native town (auditory-verbal) and visualized the square of business houses in this town.

"[K]ept in damp cellars, the tea soon spoiled." *L* referred this visually to large chests of tea in a warehouse.

"[K]ine were feeding in the meadow." *L* visualized an open meadow with some gray hogs feeding in it. He supplemented verbally: "Five and a half per hundred."

The observers frequently give very minute and exact details of their visual references. A particular part of the environment is taken up into the focus of attention and made especially distinct and clear. This may or may not represent the most significant part of the context.

"[S]and had been heaped upon the track." *Wh* visualized a railroad track about ten feet away and four or five feet long. A heap of sand three or four feet high was piled upon it.

"[T]ubes of brass were filled with powder." *W* misinterpreted *brass* as *grass*, and the latter word gave rise to the visual idea of dusty grass. Later this gave place to the visual idea of a shining brass tube.

"[H]it the nail on the head." *L* visualized a nail and a hammer raised as if to strike it. The sentence was also apperceived in its figurative significance.

"[G]ulls followed in the wake of the steamer." *L* referred this visually to the idea of a bay dotted over with gulls. "Can see them swooping down in their curves." *L* was convinced that this was accompanied by eye-movements.

"[J]og along through life at an easy gait." *L* referred this to a horse trotting along a country road. The rhythmic rise and fall of the haunches and harness were especially distinct.

"The sil[v]er lining is not always obvious." *Wh* visualized a mass of red clouds as seen from a window at which he frequently stands at sundown.

"The mer(c)iful conqueror spared his enemies." This was interpreted by *L* as "The miracle conjurer stared his enemies." It was referred visually to the 'medicine man' of a savage tribe confronted in his practices by a civilized people. "The man had feathers in his hair; his skin was very dark, and a blanket was thrown over his shoulders."

"The wheel had worn a groo[ve] in the iron rail." *W* visualized a finely cogged brass wheel about one inch in diameter. "Forgot all about the rail."

"Before the invalid awoke from his slee[p], the doctor had returned." *L* visualized a patient in a hospital cot. "Everything was neat and clean." The situation was referred to Grace Hospital, Toronto.

"A balmy bree[ze] wafted us to the south." *L* referred this to a trade-wind (probably in verbal terms) and visualized a sailing vessel in tropical seas. "It was a two-masted schooner. The sails were especially prominent and very white."

"The man betrayed his Sco[tch] blood by his accent." *C* referred this to a professor who had told a Scotch story during a lecture. She visualized the man as standing upon the platform, the head and shoulders being the prominent features of the image.

"A mighty shou[t] went up from the assembled multitude." *L* referred this to a Roman mob addressed by Antony. He visualized Antony holding up a piece of drapery to the gaze of the crowd.

"He was wont to bra[g] of his great deeds." *L* referred this to Bob Acres before his duel with Captain Absolute. He visualized a man with a crestfallen expression, pointing at a stile.

"That splendid ru[g] came from the Orient." *L* visualized a map of the eastern Mediterranean, the Archipelago being represented with great detail. Orient was visualized with a capital O. There was a fleeting image of a typical Turk, supplemented by the verbal idea, 'Ottoman.'

"The howling wind set the windows rattling and the doors sla[mm]ing." *W* heard the slamming and the rattling. "The curtains at the window were green." (This last bit of introspection shows how irrelevant are some of the details that come into the focus of attention and occupy a position in consciousness which is quite inconsistent with their significance to the 'meaning' of the sentence.)

"I had often witnessed the scene he had been descri(b)ing." *L* interpreted descri(b)ing as *descriing*. The conscious contents had reference to an outlook from a ship's deck,—looking at a distant object through binoculars. *L* also visualized a number of persons "shielding the eyes with the hand;" also the water and a bulwark. With it all he noticed a strain about the eyes,—a 'squint.'

"We were to travel through Europe on bi[c]ycles." *W* referred this visually to a woman of her acquaintance who expects to visit Europe in this way. She saw her climbing a hill on her wheel. "The day was bright and clear."

"On the wall hung a painting and two e(tch)ings." *W* referred this to two long high walls with the pictures upon them. *L* misinterpreted the sentence as, "On the wall hung a picture at two angles." He visualized an unframed screen with a painting upon it. This was standing in the corner and bent to the angle of the corner. "The picture was very large."

"He went into business with his fa[th]er." *L* referred this verbally to a plumber and visualized a dirty-faced, lead-marked man dressed in working cottonades.

"Crou(ch)ing by his side was the faithful dog." *Wh* interpreted *crouching* as *following*, and visualized a man and a dog. "The dog was large; the man poor and shabby. The dog was 'sneaking' along with his head down."

"The roof was supported by an iron bea(m)." *L* misinterpreted *bea(m)* as *prop*. He visualized a building supported from the side by a long pole or buttress. There was a detailed image of a long parallel epipedal iron support. This was supplemented by the idea (modality uncertain) of a wind-storm threatening the building.

17. *The form which the visual reference most commonly takes is that of an ideal reproduction, not of the contextually represented environment as a whole, but only of certain parts of such an environment; the visual idea merely serving to reinforce the general conscious contents which accompany the apperceptive process, and not necessarily forming the focal part of such contents.*

Illustrations: "(Z)eal is not lacking for the enterprise." This was interpreted by *L* as "Steel is not lacking for the enterprise." While the sentence meant to him that "backbone and force were not lacking," he supplemented this interpretation with the visual image of a bayonet.

"[R]eed instruments are replaced by string instruments." *Wh* in this connection visualized an orchestra. The reed instruments were represented by clarionets, the string instruments by violins. These things were reproduced very vaguely. With the same sentence *L* visualized a mouth 'harmonica' and a banjo; *i. e.*, the generic names reed and string were reduced to these concrete objects.

"The army comprised some ten thousand (m)en." *L* misinterpreted (m)en as *ants* and later as *tents*. With *ants* the reference was to the militarism of an ant colony. *Tents* gave rise to the visual reproduction of a militia camping ground covered with white tents. "The latter was a definite picture, the former only a word and the image of an ant."

"Con(s)ider for a moment the effects of the measure." This was reported by *L* as, "It bettered for a moment the effects of the measure." *L* visualized a "lot of heads and one man standing up," which represented for him the idea of a legislative assembly.

"We detected a faint odor of [m]usk." *L* imaged a wet muskrat, the long tail being especially distinct.

"The dim[ly] lighted chapel was filled with women." *C* referred this visually to Sage Chapel, Cornell University. *W* referred it to the chapel of a Chicago hospital. *L* referred it to the interior of Sage Chapel.

"The un[m]apped territory of the earth is not extensive." *L* "thought in a general way" of government surveys and visualized two men who are engaged upon the coast survey.

"Ingen[io]us contrivances sometimes earn fortunes." *W* referred this to a new piece of acoustic apparatus in the psychological laboratory. Then, by way of the fall-phonometer which stood near by, the idea of 'slot-machine' was successively associated.

"To touch the he[m] of his garment would cure all diseases." *Wh* imaged a Sunday School chart. *C* visualized a garment with a wide hem.

"The time was ri[pe] for a concerted movement." *L* referred this to Roberts's campaign in South Africa. This reference was partly verbal and partly visual. He pictured Roberts and the outline of a besieged city. The rest was supplemented verbally except for an indefinite mass of soldiery.

"By his si[de] crouched the faithful dog." *W* "saw the dog—a yellowish brown bird dog. He had been mistreated and was cringing." *Wh* visualized a man "and a thin, scrawny dog with its tail between its legs. It was a winter scene."

"Several black ba(ss) were caught in the stream." *L* misinterpreted *ba(ss)* as *bear*. He visualized a black bear and a deer swimming in a stream. The prominent idea in consciousness, however, was connected with the laws forbidding the killing of deer during certain seasons.

"It is often hard to reduce a compound to its ele[m]ents." The verbal reference 'chemical analysis' was probably the prominent part of *L*'s apperceptive consciousness. It was supplemented by a vague visualization of a number of test-tubes.

"The word was not in the voca[b]ulary." *L* referred this to a word in Fechner's 'Elemente der Psychophysik.' He could not remember the word but visualized a page and knew its position on the page. *Wh* with the same sentence visualized Webster's Dictionary.

"The ring was set with ru[b]ies." *L* pictured a ring with a beautiful setting. This was accompanied by the verbal associate 'marriage.' He thought particularly of the coloring of the stone and wondered if it was explainable on the same principle as the coloring of pearls. This involved the visual reproduction of a diagram of dispersion phenomena.

"No one doubts the moral efficiency of re[p]entance." Here the visual reproduction of the gates of the Auburn prison was an accessory part of *L*'s apperceptive consciousness.

"He occupied a roo[m] on the fourth floor." *L* referred this to a

building on the university campus. He visualized the building. *C* visualized the same building. *Wh* imaged a dormitory at Brown University. None appears to have had a definite visual reference to the man or to the room, the building monopolizing the visual consciousness of the time.

"Of[v]er the divide was the promised land." *W* thought of *divide* visually as a chasm or gulch. With *L*, *divide* suggested a log-boom in a river. *Promised land* gave rise to the reproduction of picture of Moses on Nebo, which *L* had seen in Sunday School.

"A dea[f]ening roar heralded the disaster." *Wh* visualized an explosion, but heard nothing. With *L*, *roar* suggested a waterfall in visual terms and the sound of a waterfall in auditory terms.

In all the above examples it will be noted that the visual part of the apperceptive consciousness is frequently supplemented by other references, principally verbal in character, all of which function together in apperception. Now this group of conscious elements comes into prominence, now that group, and only the more striking are noted in the introspective reports. As *L* said at the close of one report: "The interpretation involves fragmentary images, now of this, now of that modality. I can note only a few of these, but there are others there." As to the importance of the kinaesthetic elements upon which Bawden¹ has laid so much stress, the results of our experiments permit only of the assertion that the kinaesthetic factors very seldom come into the focus of consciousness. Some of the more typical references of this class are given below :

"(Kn)eel before misfortune if you will." *Wh* misinterpreted (*kn*)eel as *yield*. The kinaesthetic concomitants of kneeling and bowing were present.

"[H]unt for the word in the dictionary." *L* experienced the 'feel' of rapidly 'leafing' the pages of the lexicon in hunting for Greek words. He also visualized the face of a man in the library of the University of Toronto,—'a big fellow with a blue coat.'

"[Sh]un evil companions." Here *L*, along with a verbal and visual reference to a Sunday School, experienced an auditory-kinaesthetic reproduction of a Sunday School song.

"[J]oy and sorrow are sprinkled about equally among men." *Wh* "interpreted *sprinkled* by a centrally-excited arm-movement idea of scattering seed."

"Har[m]onious relations have been established." *Wh* reported in the protocol: "'Harmonious relations' means a smoothing over; this in my consciousness is the image of an outward movement of the hands."

"The care of the tee[th] is a matter of importance." *Wh* experienced the kinaesthetic concomitants of brushing the teeth.

"He was not su[re] of the matter." *L* visualized a person perplexed; *i. e.*, with certain characteristics of the face denoting perplexity, such as the drawing together of the eyes and a general tension. *L* reproduced such an adjustment.

"One often feels the nee[d] of exercise." *Wh* referred this to the idea of bicycling. In this idea the kinaesthetic elements were predominant, but they were supplemented by verbal and visual elements.

¹ Bawden : *op. cit.*, pp. 65 ff.

He imaged himself as coming up a sharp incline near the university library. Just before hearing the sentence he had been conversing about bicycling.

"Every man possesses an ele[m]ent of the divine." In this connection *Wh* experienced a kinaesthetic 'upness' supplemented by a vague visualization of clouds and the verbal idea, 'God.'

"He was unable to maintain his po[s]ition." *L* referred this to the situation a public lecturer would be in if his position was assailed. This reference took form in "internal disturbances, such as quailing."

"Gri(p)ing pains preceded death." *L* misinterpreted *gri(p)ing* as *lying*. He had a verbal and kinaesthetic reference to a death struggle. This involved centrally excited muscle and strain sensations.

"Bo(wl)ing is an excellent exercise." *L* misinterpreted *bo(wl)ing* as *rowing*. He referred the sentence to an experience in camping, the prominent part of the recollection being the 'feeling' of a well muscled arm.

"He was wrapped in the soundest slee[p]." *L* visualized a man wrapped in a blanket, and referred the sentence to the idea of calmness and rest in terms of muscular relaxation.

"It is said that there is always roo[m] at the top." Here again *Wh* experienced the kinaesthetic idea of 'upness.'

"As a joke it was simply hu[ge]." *Wh* noted a "motor laughter fringe" as a prominent part of the apperceptive consciousness.

Purely auditory supplements are met with in the reports much more infrequently than kinaesthetic supplements, and it may be inferred that they very seldom come into the focus of attention during the apperceptive process. A few examples are given below:

"He had been shot through the chest, and lay on the ground wri[th]ing." *L* referred this to a wounded soldier; he "seemed to hear him groan."

"They were almost stunned by the concu[ssi]on." *L* imaged the sound of blasting, and accompanied this with a motor adjustment about the face.

"The concussion was dea[f]ening." Here *W* experienced a "peculiar sensation in the ears."

"The man betrayed his Sco[tch] blood by his accent." *L* imaged a large, freckled-faced Scotchman; "seemed to hear a Scotch 'twang.'"

In the sentences already cited, "Not a man ha[s] had his vote refused him," and "A dea[f]ening roar heralded the disaster," *L* reported auditory references, in the first case to the noise of a city on election night, and in the second case to the roar of a waterfall.

Taste and smell elements may be said to play a very unimportant part in the ordinary apperceptive consciousness. The following sentences gave the only instances of such references.

"Diseased tissues are studied by pa[th]ologists." *W* referred this to the idea of a biological laboratory. This was mainly visual but was supplemented by a centrally-excited olfactory sensation.

"The fire was almost smo[th]ered." *L* visualized a dense black smoke. He experienced a stifling 'feeling' in his throat and nose, and reproduced ideally the odor of smoke.

"We detected a faint odor of [m]usk." *L* ideally reproduced a vague and indefinite musk odor.

"(J)am is generally liked by the small boy." *Wh* misinterpreted

(*y*)*am* as *ham* and ideally reproduced a faint taste of ham. (This was just before the lunch hour.)

Temperature elements were noted in only two instances:

"The winter came and the river fro[ze]." *W* had a faint ideal reproduction of a sensation of cold.

"The howling of the wolves disturbed our slee[p]." *L* visualized a mountain side covered with snow. This idea was supplemented by temperature images.

18. *Verbal ideas exist more frequently as associative or contextual supplements than as the focal objects of the apperceptive consciousness.*

Illustrations: "[D]eed[s] of kindness are seldom appreciated." *L* visualized a person of his acquaintance who proved himself ungrateful for a service rendered him. This was verbally supplemented by 'ingratitude.'

"The navy consisted of two ships and a bri[g]." *C* was unable to remember the distinguishing characteristics of a brig. She visualized a Norwegian barge of ancient type and verbally supplemented the date '418.'

"The siege was interrupted by a tru(ce)." This was misinterpreted by *L* as "The speech was interrupted by a True." *True* meant to him the name of a man. It was associated with 'Blue,' the name of a French Canadian partisan.

"[T]ips from good authorities cause some activity in the market." Aside from a focal visual reference, *L* supplied the verbal supplements 'wheat,' 'board of trade.'

"[H]old fast to that which is good." *L* associated the names 'Paul,' 'New Testament.'

"[Sch]ools of fish were found off the bar." *L* visualized a fleet of smacks off Newfoundland in a fog. The nets were tangled and the fish could be seen through the meshes. The word *school* was taken in its educational significance and was supplemented by a vague visual idea of a schoolhouse—a large stone building.

"(J)ute is a product of the tropics." (*J*)ute was misinterpreted by *L* as *Juch*. This word was referred visually to a picture of Emma Juch, the opera singer, and was verbally supplemented by the words, 'Toronto Opera House.'

"The pur[p]ose of religion is ethical." *Wh* referred this verbally to 'Tarde.'

"The still[n]ess was appalling." *Wh* verbally associated the terms 'lake,' 'solitude.'

"The chan[g]es in the course were misleading." *L* visualized the catalogue of Toronto University and supplemented it verbally with the word 'curriculum.' *L* also visualized the peculiar expression on the face of an old professor who remarked that one could find nothing that one wished to find in a university catalogue. "The face was all screwed up."

"An an(ci)ent proverb is often a modern fallacy." *L* first interpreted an(ci)ent as *Indian*, and immediately supplemented verbally the phrase: "The only good Indian is a dead Indian." This suggested that the white man's proverbs are often fallacies, and then *ancient* suddenly came up to replace *Indian*.

"The army was sa[fe] behind its trenches." *Wh* had a vague visualization of a trench filled with men,—probably a reproduction of a newspaper sketch. This was verbally supplemented by 'Boers.'

"It was rumored that the war was o[v]er." *Wh*'s first reaction was

verbal, 'Boers.' *L* visualized a mass of soldiery and verbally supplemented 'Roberts.'

"The flocks were watched by she[ph]erds." *W* visualized a Sunday School card and verbally supplemented the phrase: "Shepherds watched their flocks by night."

"I caught the words he was dro[pp]ing." *L* referred this (in predominantly visual terms) to one person in an auditorium listening to another speaking at a long distance. This was supplemented verbally by 'heavy.'

19. *When the verbal ideas occupy the focus of consciousness, they usually take the form of antithetical or explanatory clauses. Such clauses are sometimes found as the verbal supplements of the focal idea. The sentences which lend themselves most readily to these antitheses, completions, and supplementings, are usually short sentences which arouse a minimum of visual imagery, and in which the affective element is strong; they often awaken in the hearer an attitude of dissatisfaction, a mood of humor, or a feeling of incompleteness.*

Illustrations: "[P]uns are jokes of a low order." *L* immediately added, "And therefore discredited as witticisms."

"[H]eard the advice of an elderly woman." *Wb* supplemented: "Pity the sorrows of a poor old man, but heed the advice of an elderly woman."

"We did not see the train approa[ch]ing." *W*'s immediate reaction: "Were they run over?" Then came a visual reference to a kinetoscope reproduction of a railroad collision. The kinetoscope films were running backwards.

"His death must be reported to the au[th]orities." *L*'s verbal reaction, "Yes, death and birth registrations are compulsory."

"To slee[p]: perchance to dream: ay, there's the rub." While the phonograph was repeating the sentence, *Wb* said to himself, "He's quoting Shakespeare."

"In her arms she held the ba(be)" *L* pictured in her arms as a printed phrase. Later there came up, "In her arms she held the bay." *L* could not tell how this came; he "heard babe very distinctly." As a matter of fact, *ba*(be) was mutilated and sounded *bā*. *Bā* must have been present in the fringe of consciousness, but before it came into the focus it had been associatively supplemented into *babe*. Then the original impression became focalized and *bay* was apperceived.

"The scientist may claim his kinship with the a[pe]." *W*'s first reaction: "A preacher must have said it."

"One man broke a rib and a collar-bo[ne]." *L* visualized a rib and verbally supplemented the sentence with the phrase: "Pretty badly damaged. How? By a fall? Accident? Intentional?" "Platitude.

"A loss will always be greater or le[ss]." *L*'s reaction: "What of it?" Affective tone, very unpleasant.

20. *Occasionally the observer's apperceptive process anticipates the succession of symbols constituting the objective stimuli and forming the spoken sentence. This phenomenon is probably often unnoticed because the premature apperception tallies with the complete interpretation; but sometimes this coincidence fails, and the observer is conscious of a distinct 'bias' for another form of completion,—a bias which frequently expresses itself in verbal terms.*

Illustrations: "Of all that little band of men, he was the bra[v]jest." *C* did not hear *band of men* distinctly, and misinterpreted it as the nonsense word, *valment*. She wished, however, to insert *regiment* and would have done so, had the sounds which she heard warranted it. The word *regiment* was consciously present as an incipient laryngeal innervation. She felt it "echo and re-echo in her throat."

"One cannot deny that most office holders are ra[p]acious." *Wh*, *C*, and *L* wished to make it *post-office* instead of *most office*. This is simply a prejudice in favor of a more familiar combination of sounds.

"The hedge needed pru[n]ing." *Wh* had already supplied *trimming* before *pruning* was perceived. He had also visualized a hedge around a small white house. This last was a boyhood recollection.

"He had left word that he would be extremely bu[s]y." Before the last words were perceived by *W*, she had already supplied "would not be at home."

"For conquest he had a strange i(tch)ing." *L* misinterpreted *i(tch)ing* as *aim*, but had a prejudice in favor of *ambition* and with this verbal idea had already supplemented a visualization of Bonaparte.

"That the man was bra(ve) no one could deny." *C* wished to say, "That the man was to blame, etc.," but she misinterpreted *man* as well as *bra(ve)*, and finally reported the sentence, "That the demand was blame, no one could deny." This was referred visually to an absconding official whose defalcation was just then the sensation of the hour.

"He desired to li[ve] in luxury while he could." *Wb* "wished to make it come out something about the 'lap of luxury.'"

"No one dared to lau(gh) at the situation." *Wb* tried to make it into: "No one dared to analyze the situation."

"Not one in te[n] knew of the transformation." *C* would rather have said *transaction*, which would have meant to her "a change in partners."

"That the movement was ra(sh) could not be denied." *Wb* visualized an army manœuvring in the field and supplemented the word 'Boers.' He had an impulse to make the mutilated word into *rare*. He "heard the two sentences pass through his mind."

"The fa(th)er who is wise may use the rod." *Wb* first interpreted *fa(th)er* as *farmer*, and expected the sentence to be, "The farmer who is wise may do so and so." When *father* was supplied, the phrase, "Spare the rod and spoil the child," was supplemented.

"The co[ll]ar which he wears is number sixteen." *W* had anticipated "The collar was soiled," and had visualized a soiled collar.

21. *In the observers tested, reactions which were 'professional' in character were almost always verbal in form.*¹

Illustrations: "The light was di[m] and faltering." *Wb* had a vague visualization,—"too faint to describe." Afterwards he thought, largely in verbal terms, of the difficulty of getting a standard illumination in experiments upon optics. *C* referred the same sentence to the construction of the laboratory dark room.

"Pleasure and pai[n] are the extremes of feeling." *L* "figured 'p-p' in print" as his note-book abbreviation for 'pleasure-pain' theor-

¹ Cf. Stanley, H. M.: *Language and Image*, *Psychological Review*, Vol. IV (1897), p. 71. Cf., also, Philippe, Jean, *Revue Philosophique* Vol. XLIV (1897), p. 523: "Moins les images sont nombreuses, plus elles sont concrètes; elles se généralisent et perdent leurs caractères individuels et particuliers à mesure qu'on les renouvelle."

ies. He associated a verbal supplement: "Many think that pleasure-pain is everything in feeling."

"Re(p)entance is not in itself constructive." *L* interpreted the first word as *re-entrance*. He also verbalized the logical definition of mental construction.

"Pro[v]ing another's error is a negative process." *L* visualized *error* as a printed word, and associated the sentence with the idea of negation in Hegel's dialectic. This was largely in verbal terms.

"Phi(1)istinism is a latter-day virtue." *L* misinterpreted *Phi(1)istinism* as *Christianism*; *Latter-day* suggested *saints* and the expression in 'Hebrews,' "These latter days." *L* visualized this in print (Greek), and translated it verbally into English. He "saw it on a page of his Greek testament."

"Phi[1]osophy is the matrix of science." *Wh* associated this in 'thought' terms with Spencer's doctrine of the relation between science and philosophy.

22. *Certain 'turns of speech' are constantly referred to certain uniform 'sets' or patterns of ideational material. Such sets or patterns may be called 'constant supplements' or 'type associates.'*¹

Illustrations: "[S]ales of wheat were very large." Whenever the term *wheat* is used in this or in a similar connection, *Wh* visualizes a farming scene in the northwest,—a reproduction of a picture in his school geography.

"[T]ips from good authorities caused some activity in the market." With the word *tips*, *L* constantly images a man's hand in a 'sly' position, as if handing money to a waiter.

"[T]ops of distant mountains could be seen." The word *mountains* with *L* is constantly supplemented by a visualization of a distant range of mountains which he once saw in Manitoba. "They are hazy in the distance."

"[F]ame does not always accompany poverty." *L* notes that he constantly refers *fame* to the visual idea of Lincoln as a farm-hand.

"[Sch]ools of fish were found off the bar." With references to *sea*, *Wh* constantly associates a stretch of green water bordered by a narrow strip of yellow sand.

"[C]aves of great extent honeycomb the hills." *L* constantly supplements the word *honeycomb* with the visual idea of Hell Gate rock artificially honeycombed for the blasting powder which is to destroy it. He pictures the rock "bored by a great system of holes and elaborately charged for explosion."

"[K]een business men perceived the situation." With *keen*, *L* constantly envisages a knife blade about two inches long and very sharp.

"The Irish[m]an is famous for his ready wit." With *Irishman Wh*'s constant supplement is the visual idea of a bricklayer with a red beard supplemented by the auditory idea of a pronounced brogue.

"The in[f]inite reaches of space baffle the imagination." With

¹ Galton has called attention to this phenomenon. Cf. *Inquiries into Human Faculty*. London, 1883, pp. 157 ff. Cf., also, cases cited by Whipple, G. M., this *Journal*, Vol. XI, No. 3 (1900), p. 391; also Philippe, *op. cit.*, p. 524: "Cependant il faut bien noter que cette tendance à la généralisation se fait jour dès l'entrée du groupe d'images et semble se manifester tout d'abord par la tendance d'une certaine image à dominer toutes les autres et à les absorber. Il se forme en quelque sorte un centre de généralisation, vers lequel convergeront naturellement les images à venir."

infinite, *W* always experiences a centrally-aroused blackness of great extent, in the center of which she is standing. *Infinite time* is a river flowing very slowly—"not another thing around it."

"Yon[d]er is the library building." With *yonder*, *L* constantly visualizes a hand pressing forward. With *mystery*, *L* experiences a centrally-aroused blackness.

"Drin[k]ing-water should be boiled." *L* referred this verbally to 'Toronto.' With *Toronto*, he has the constant visual supplement of the city as seen from the water-front.

"The dim[l]y lighted chapel was filled with women." *L* referred this to Sage Chapel, Cornell University. In this connection he associated verbally 'President Schurman.' This name is constantly supplemented by the image of a large man in gray clothes. (*L* had at that time never seen President Schurman.)

"The religious spirit is predominantly e[m]otional." *W* verbally associated 'shrine' which brought up its supplement,—the image of a figure kneeling before a confessional.

"Gluttony is an euphemism for stu[ff]ing." *L* has the constant verbal supplement 'Sir Walter Scott' with *euphemism*. It was in one of Scott's novels that *L* first saw the term.

"He went into business with his fa[th]er." With *business*, *Wb* constantly envisages the business square of his native town.

"He was lost in a ma[ze] of verbalism." *L* verbally associated 'logomachy' and visualized a person "throwing off words that did n't mean anything." This led to the verbal associate 'tongue-tangle' which brought up its constant supplement, the visual idea of a mass of knotted thread.

"Fe[tch]ing and carrying is the portion of the slave." With *slave*, *W* always visualizes a stout negro and the background of a southern plantation house.

"The structure was simply stu[p]endous." With *stupendous*, *L* associates the image of a high cliff. With *decision*, *L* sees Cromwell's face, particularly the lower jaw.

"Clo[th]ing is necessary in cold climates." *Wb* has with *cold*, a constant reference to a picture in his school geography representing an Arctic scene.

"Be[y]ond matter is spirit." With *beyond*, *L* constantly visualizes a chasm.

23. *Particular parts of a context are often visualized as printed, or heard out separately ('auditized'). This usually occurs (a) when there is a conflict between two words which resemble one another in sound, (b) when a word is quite unfamiliar, and (c) when the word is very important to the 'meaning' of the entire sentence.*

Observers of the auditory type tend to hear the word spelled out or pronounced very distinctly, observers of the visual type tend to see it printed. It is obvious that both these operations tend to concentrate the attention upon the word in question. In the visually minded observers, the attention is more easily fixed upon visual ideational elements than upon auditory ideational elements, hence the tendency to translate the sound-symbols into visual symbols. *L*'s ability to see clearly only part of the word at a time,—three or four letters at the most being simul-

taneously distinct,—is in accord with Raymond Dodge's¹ results in the analysis of the verbal idea.

Illustrations: "Di[v]ersity of interest may not be a bar to friendship." *L* visualized *diversity*, *interest*, and *friendship*. The latter gave a particularly distinct *fr* at the beginning; the rest not so clear.

"The re[v]elation of the universe may be variously interpreted." *L* found flaws in *revelation* and *variously*, which led him to visualize both words as printed.

"The older animals are harder to ta[me]." *L* visualized animals, *ani* being especially distinct.

"As a Russian he was a typical Scla[v]." *L* visualized *Russian* with an especially large *R*. *Sclav* was also visualized, *v* being very clear. All this was immediate with the sound of the words.

"It was a remarkably clever tra[p]." *L* visualized *ark* of *remarkably*.

"He seemed to te[ll] the truth." *C* imagined the magazine 'Truth,' visualizing the title very distinctly. Immediately afterward, *truth* was reproduced auditorily.

"It was an ele[m]ent of which the community was well rid. *L* imaged the *ele* of *elements*.

"The dogs were held in lea[sh]." *C* was not familiar with the term, *leash*. She had heard it before, once or twice at most. She "had a tendency to spell the word out."

"They went early to avoid the ru[sh]." To *L*, *went* sounded like *wepit*. *Went* was finally confirmed by the context and was then visualized and auditized.

"The idea was very va[gue]." *L* visualized the word *idea*, and noted a tendency to put *r* on the end of it.

24. *With certain types of sentences the references of the various observers are approximately identical. These are usually (a) sentences in which the 'meaning' is unequivocal; (b) sentences in which a certain word or 'turn of speech' suggests a familiar proverb or stereotyped phrase; and (c) sentences which refer to local or common objects and events.*

This identity of reference was not met with frequently, and this fact leads one to doubt Stout's² conclusion that language as a means of communication "serves to fix the attention of the hearer on the ideally represented objects present in the mind of the speaker." At least such a statement is only part of the truth. Symbolic communication serves indeed to transmit the experience of the speaker to the hearer, but the manner in which the speaker's 'meaning' is taken by the hearer is conditioned entirely by the hearer's own experience. Language does not fix the attention of the hearer upon the experience of the speaker; it rather places the hearer in an ideally constructed experience which approximates—and generally only very roughly—to the experience of the speaker. This fact is more clearly shown under 25, below.

Illustrations: "By his si[de] crouched the faithful dog." *W*, *L*

¹ Dodge, R.: *op. cit.*, pp. 14-15.

² Stout, G. F.: *A Manual of Psychology*. London, 1899, p. 452.

and *Wb* all visualized a man with an ill-kempt dog cringing at his feet. In *L*'s visualization the man was represented as dead.

"A sulphur or a vapor ba[th] is recommended for the complaint." *L* and *Wb* imaged a vapor bath cabinet such as is advertised in the magazines.

"The evil will remain as lo[ng] as men are human." *L* and *C* immediately associated verbally the proverb, "To err is human, to forgive, divine."

"The bank was slo(p)ing." *L* and *W* misinterpreted *slo(p)ing* as *closing*. Each visualized a familiar bank building. *L* supplemented his visualization by the verbal associates, "Saturday, one-o'clock, too late."¹

"The structure was simply stu[p]endous." *Wb* at first referred this indefinitely to Ramón y Cajal's schema of the chiasma. Later he visualized a 'sky-scraper' in New York. With the same sentence *L* visualized a Chicago 'sky-scraper.'

"The voca[b]ulary is an important part of the book." *L* and *W* referred this visually to the first Latin exercise books which they had used.

"They shou[t]ed lies to each other across seas of misunderstanding." *W*, *L* and *Wb* each supplemented this sentence with a visual reference to the ocean.

"They are goods which will wa[sh]." *W* visualized the interior of a store. A salesman was impressing upon a customer that the goods would wash. The counter was covered with blue gingham. *L* visualized a similar scene, but not with such detail; he supplemented this with the verbal idea 'fast colors.' *Wb* visualized the interior of a store. The counter was a little to his left. The goods—cheap dress goods—were laid out in rolls. The clerk was bending over the counter and earnestly making the statement that the goods would wash.

25. *The imagery which apperception involves is not always consistent with the significance of the context; yet this does not necessarily mean that the significance is inadequately apperceived.*

The ideally reconstructed environment, if visual, may include objects the absence of which the speaker clearly intended the sentence to indicate; or there may be in the field of the apperceptive consciousness a complex of irrelevant elements. Stout² says that the "word only calls up what is relevant to the controlling interest of the thought," but what is relevant differs with speaker and hearer. In both cases it is determined by the 'personal equation,' by differences in experience, by the quality of the 'apperceptive' material.

Illustrations: "They were skating on the i[ce]." *L* visualized the surface of Lake Cayuga, unfrozen.

"The judge wore the ermine ro[be]." *Wb* visualized a man representing the judge, but the details of his costume did not come into clear consciousness.

"They were woven on an old-time loo[m]." *W* referred this to a modern woolen-mill.

"Pollu[t]ion of the ballot is the curse of democracy." Here *L* had a verbal reference to 'ballot,' but visualized muddy water.

¹ Cf. Dodge, R.: *op. cit.*, p. II.

² Stout: *op. cit.*, p. 462.

"The council chose the si[te] for the new building." *Wb* referred this in a vague way to the Common Council of Salem, Mass. He visualized a building in Ithaca, but not a public building.

26. *Distraction of the attention militates against the complete apperception of the meaning of the sentence. This distraction is frequently caused by some peculiarity in the mechanism of the sentence, such, e. g., as the mutilation of an important word.*

While this principle as formulated above is an induction from the introspective data, it would follow *a priori* from our conception of apperception as the functional aspect of attention. In many of the instances which are cited below, the observer has 'a vague idea' of what the sentence means. They might be called instances of an incomplete or partial apperception, and no small part of our communicative experience is probably of this kind. As a rule, however, both the efficient expression of symbols and the efficient interpretation of symbols are possible only under stress of the attention: the processes involved seldom become automatic, and when automatic fail to function with efficiency.¹

Illustrations: "The evil will exist as lo[ng] as the race is human." *Wb* repeated the sentence mechanically, but it was characterized by him as "only words;" it aroused no associations. The attention was distracted throughout.

"It was a mo[m]ent that was most impressive." *Wb* "kept thinking of the voice; it sounded excited; had no apperception of the meaning."

"The cloth will fa[de] if exposed to the sunlight." *Wb* reports his attention at a low ebb. He did not hear *cloth* or *fade* until the sentence was finished. Afterward he visualized the place at his home where fabrics are bleached by being spread upon the grass and exposed to the sunlight.

"The la(d) was fresh from the country." *Wb* first supplied *lad*, which he reported, then *lass*; then he returned and substituted *lad*. This operation absorbed his attention, and he had no definite reference for the sentence.

"To win the be(t), he had sacrificed his good name and character." The attention of *Wb* was absorbed by the mutilated word *be(t)*. Although he finally filled it out correctly, he could not analyze the process. "There was present some sensory content, but it was very vague. The whole process appeared to be verbal."

"He left the prisoner to his fa[te]." *W* was distracted by the tone of the voice as reproduced by the phonograph, and did not apperceive the meaning of the sentence.

"The sermon was unconscionably lo[ng]." *L's* attention was centered upon *unconscionably*. He pictured the word in print, and referred to various efforts at pronouncing it. One man was visualized in particular. The general import of the sentence was entirely missed.

¹ H. H. Bawden (*op. cit.*, p. 120,) has emphasized the importance of attention in verbal expression: "Conscious experience is a constant disturbance of the tendency toward equilibrium between the automatic and attentional processes. Errors, or lapses, appear in the readjustment in the tension between these two processes."

27. *Familiarity with the sentence sometimes militates against a clear and definite reference on the part of the observer.*

Illustrations: "[D]eath is a beneficial thing, biologically." *Wb* had heard the sentence spoken into the phonograph, and after the first few words paid no more attention to it. "All associations seemed swallowed up by this one reference to the previous hearing of the sentence."

"The use of rou[ge] is pardonable only in the green room." *Wb* had already heard the sentence and "experienced a feeling of 'dead familiarity' with it." He had, however, a very vague visualization of the stage of a familiar theater; this was supplemented by the image of a woman of his acquaintance who uses perfumes.

"Obli[g]ing individuals are generally poor." *L* reports the sentence as having a 'familiar feel.' It aroused no definite reference.

"Be[y]ond matter is spirit." The thought was familiar to *W*, and aroused no definite reference.

28. *A characteristic feature of the apperceptive consciousness is the constant change of its pattern to meet the changes in the context.*

In many sentences, the reference which the first few words arouse is inconsistent with the succeeding parts of the context; the supplementing of one word or phrase fails to supplement the sentence as a whole: the observer is in one attitude, has one adaptation, at one point in the sentence; at another the attitude changes, there is a new adaptation and a new shift of the mental scenery.¹

Illustrations: "That the man was brave, no one could deny." *Wb* first interpreted the sentence as, "That the man was gray, no one could deny." This was unsatisfactory and led to a new construction. *Brave* seemed to "struggle up from the inside of the head and come to the front."

"The wheel had worn a groo[ve] in the iron rail." *Wb* at first referred *wheel* visually to a bicycle. When *groove* was heard the reference was changed to the idea of machinery. When *rail* was heard, a railroad was visualized and later a street-car track.

"He had not yet lost fai(th) in the enterprise." *L* misinterpreted *fai(th)* as a *day*. At first he referred the sentence visually to a man diligently at work; this was before *enterprise* was spoken. With *enterprise* "the conscious reference assumed another setting which expressed itself in the thought that the man had put no time at all into the undertaking."

"The king's ro(be) was yellow." *L* misinterpreted *ro(be)* as *row*. He referred visually to the king's row of tombs at Westminster Abbey. Later *row* was apperceived as signifying a boat, and a long yellow shell was imaged.

"The fifty-ton sloo[p]-of-war captured a frigate." *L* referred this to a

¹ Cf. Stern, L. W.: (Psychologie der Veraenderungsauffassung. Breslau, 1898, p. 147.) "However sovereign the spontaneity of attention is as regards constant sensations, it is just as dependent upon the changing ones. Determined by central factors, it directs itself toward the former; the latter compel it to themselves. They are themselves motives of the adjustment of attention."

naval engagement. He visualized Paul Jones with a 'cocked' hat. *Sloop* was supplemented by the visual idea of a single masted sailing-ship. This dropped out of consciousness with frigate, and was replaced by the idea of two large battle-ships.

"Several black ba(ss) were caught in the stream." *Wb* at first misinterpreted ba(ss) as *bear*. He visualized in this connection a small black bear and a forest background. When *stream* was heard, he substituted *bass* for *bear*. The forest setting still persisted, but a hook replaced the bear as a center-piece.

"The rai(l)ing was washed away." *L* misinterpreted rai(l)ing as *rain* and referred it to the visual idea of sand washed away by rain. Later *rain* was changed to *railing* and supplemented by the image of a ship on a very rough sea.

"The king was forced to be(g)." *L* misinterpreted be(g), first as *bed* which he supplemented with the idea that the king must have been under the influence of some very strong character. Then *bed* was replaced by *back*, supplemented by the idea that the king was in danger of assassination; this took form in a visualization of a man coming before the king on horseback.

28. *When there is doubt of conflict as to the meaning of a sentence, the apperceptive consciousness is predominantly unpleasant. If the apperception of the meaning is clear and distinct, the affective tone is generally pleasant. This is apart from the intrinsic affective tone of the sentence as such, which may be pleasant unpleasant, or indifferent.*

Sentences the apperception of which was accompanied by a pleasant affective tone:

"That the man was bra[ve] no one could deny." *Wb* "felt satisfied" because he got the interpretation easily and correctly.

"Every one expected a dro[p] in the market." *Wb*. (Referred to a humorous incident.)

"Brute and ma[n] are one in their physical structure." *Wb*. ("Liked the sentence because of its length." The preceding sentences had been very short.)

"The re[v]elation of the universe may be variously interpreted." *L*. (No reason given.)

"Pou[r]ing oil on troubled waters causes them to subside." *W*. (No reason given.)

"The first horse had passed the po[le]." *L*. ("Thought of trotting race and horses neck and neck." When *pole* was heard he wished to replace it with *line*. Then he remembered that the term *post* was used in the same connection. This changed the affective coloring from unpleasant to pleasant.)

"Wi[th]out health, happiness is perhaps impossible." *Wb*. (Did not supply *health* until the sentence was completed. When it came it was accompanied by a pleasant affective tone.)

Sentences the apperception of which was accompanied by an unpleasant affective tone:

"He had lost ho[pe] in the unequal struggle." *Wb*. ("Felt sorry for the poor beggar.")

"The invalid should be fe[d] on weak broth." *W*. (Observer "dislikes broth.")

"By his si[de] crouched the faithful dog." *W*. (No reason given.)

"Sla[mm]ing doors is a trait of childhood." *W*. (No reason given.)

"Fi(r)ing too high is a common mistake." C. (Aggravated because she could not apperceive the meaning. She noticed a general tension in trying to get a word for *fi(r)ing*,—a strain about the eyes and chin.)

"The loss will be greater or le[ss]." L. (Proposition trivial.)

"The milk was brought in a ju[g]." L. (Unpleasantness came with the idea of milk, which was visualized a pale bluish-white fluid.)

"The idea was very va[gue]." L. (Observer reproduced ideally the condition he feels himself to be in when baffled by an idea. It is an unsatisfactory 'groping,' with a large affective coloring of unpleasantness.)

"The navy consisted of two ships and a bri[g]." W. ("It was so insignificant.")

"As a joke it was simply hu[ge]." L. (Last word uncertain. Feeling of bafflement, curiosity and disappointment, followed by pleasure when the word was finally supplied.) Wb. ("Had a 'motor laughter fringe' on hearing the sentence.")

In planning this investigation, we had intended to determine as nearly as possible the point in the sentence at which the apperception is completed. To this end, sentences were to be given to the observers, at first with the final word cut out, then the next, and so on until the implication of the sentence was entirely lost. Then the sentence was to be built up from the beginning, first one word being given, then another and then another until the 'thought' was complete. It was found, however, that this procedure would require a greater number of observers than was available; hence the test was left incomplete. The following statements may, however, be made: (1) The omission of the final word causes practically no disturbance to the apperception of the sentence, either the word itself or its meaning-equivalent being readily supplied by the observer. (2) Proposition 20 seems to indicate that apperception is completed early in the sentence. (3) Proposition 1 affords a certain confirmation of this hypothesis. (4) The whole trend of the introspection recorded during the second part of our experiment is to place the act of apperception early in the sentence.

We had also planned to determine the relative importance of the various parts of speech to apperception. So far as the mutilations are concerned we are able to say that 'contextual supplementing' is not a function of the syntactical character of the word.

29. *In general: The consciousness concomitant with the apperception of auditory symbols is made up of sensational and affective elements—some peripherally, some centrally aroused—in connections which vary in character with different individuals and under different conditions. These connections are arranged in patterns which change rapidly into one another, and are in general transitory and fleeting. When the attention is directed to the peripherally excited elements exclusively—when the external stimuli occupy the burning point of apperception—the meaning which they as symbols should convey is not clearly apperceived. When the attention is directed upon the centrally aroused ideas which the symbols suggest, the 'meaning' is apperceived, but errors and lapses in the stimuli are apt to pass unnoticed.*¹

Stout¹ in his exposition of 'implicit apprehension' says: "The mental state which we call *understanding the meaning of a word* need not involve any distinction of the multiplicity of parts belonging to the object signified by it. To bring this multiplicity before consciousness in its fullness or particularity would involve the imagining of objects with sensory qualities, visual, auditory,

¹Stout, G. F.: *Analytic Psychology*. London, 1896, Vol. I, Ch. iv, pp. 78 ff.

tactual, etc. But it has often been pointed out that in ordinary discourse the understanding of the import of a word is something quite distinct from having a mental image suggested by the word." And so the concept of 'implicit apprehension'—the apprehension of form without the apprehension of content—is introduced to explain the phenomena of symbolic apperception. Stout, however, goes too far when he says that there is "no absurdity in supposing a mode of presentational consciousness which is not composed of visual, auditory, tactual and other experiences derived from, and in some degree resembling in quality the sensations of the special senses; and there is no absurdity in supposing such modes of consciousness to possess a representative value or significance for thought, analogous in some degree to that which attaches to images, just as revived images may have a representative value in some degree comparable to that of sense-perceptions, in spite of very great differences in respect to distinctness, vividness and quality." From the series of observations which were made in the course of our experiment, no conscious 'stuff' was found which could not be classed as sensation or affection, when reduced to its ultimates by a rigid analysis. Neither do our experiments show that there is in the apperception of spoken sentences such a thing as 'imageless apprehension.' They show rather that the consciousness concomitant with symbolic apperception is in a state of attention, where certain constituents are clearer and more distinct and certain other constituents more obscure and less distinct; and that among the more distinct constituents, among those which occupy the focus of attention, there are always some—whether they be verbal, visual, kinaesthetic or what not—that are definitely tangible, and that can be reported by introspection.

It is true that Hobbes, Berkeley, and Dugald Stewart,—all of whom are quoted by Stout,—found it difficult to make the apprehension of symbols consistent with a sensational psychology. But these men lived and wrote before the function of the verbal idea in 'thought' processes had been thoroughly exploited; before its kinaesthetic nature had been pointed out; before the current doctrine of attention with its biological implications had been suggested; and before recognition and recollection had been differentiated in the memory process, and referred to spatially, structurally and genetically different areas in the brain cortex. It is now generally admitted that direct recognition does not necessarily involve the conscious comparison of the presentation with a memory image, and the subsequent formation of the judgment 'alike' or 'different.' And the apperception of symbols signifying bits of experience may, quite legitimately, involve a form of direct recognition, more

complicated, it is true, yet similarly devoid of any complex of visual images. But this does not imply that the apprehension is 'imageless,' in Stout's connotation of the term. Recognition is not a structural element, but a process in which certain elements unite to form the recognitory consciousness, to carry the function of recognition. But these elements are either sensations or affections. Stout's 'implicit apprehension,' on the other hand, postulates a non-sensational, non-affective element, — a schema, a form without content, a structural something that can in no way be reduced to modal elements.

The relation of apperception to attention suggests a biological significance that may do much toward clearing up these problems. Apperception is the functional side of attention, and attention is the mental aspect of organic adaptation.¹ The new is not apperceived by the old in the Herbartian sense: the new arouses a typical attitude, an attitude in which the organism faces the typical environment which the new symbolizes. We may say with Stout that the new is referred to a mental 'system,' in so far as such a system is a mood, an attitude, a tendency, an adaptation. The mind adjusts itself uniformly to uniform conditions: this seems to be the essence of the apperceptive 'mood.' When *C* in the sentence "The play was bad," interpreted play as a drama, her mind adapted itself in a degree to the drama environment. This was not necessarily a focal reference to a given play, but the mind was in the dramatic 'mood.' Should particular parts of a typical play-environment have been ideally reproduced, the situation would only have been reinforced. Should certain verbal ideas such as 'drama,' 'theaters,' 'Shakespeare,' etc., have been reproduced in consciousness, either visually, auditorily or kinaesthetically, these ideas would have been constituents of the dramatic 'mood,' but not necessarily the fundamental constituents. The fundamental constituents may and do vary from time to time. Only very seldom can they be called constant, and the 'constant supplements' which we have noticed are instances of such occasions. The fact that the focal constituents of the apperceptive consciousness are not necessarily consistent with the situation represented bears testimony to this point of view. "There was not room for a stove in the corner;" with this sentence one observer imaged distinctly a stove in the corner of a small, otherwise bare room. His own surprise at the inconsistency of this imagery was shown by his exclamation upon reporting the introspection: "But there *was* a stove there!"

In symbolic apperception, the function of language is to reproduce the appropriate mood, the consistent attitude, the more

¹ Cf. Titchener: *op. cit.*, ch. vi, pp. 118 ff.

or less uniform reaction, with which an organism would face a certain environment. Speaking broadly, we may say that each mental 'system,' each 'cortical set,' represents the adjustment of the organism to a particular environmental condition. Each adaptation marks a separate bit or pattern of experience upon the side of mind. In fact, experience might be considered as a mosaic, or rather panorama, of succeeding 'mental systems.' It is manifest that those organisms which have adapted themselves most readily and with the least friction have possessed, other things equal, the characteristics most favorable to survival. And so it is not surprising that we now find many 'short cuts' to adaptation and reaction,—that we find a verbal idea coming to represent a complex mental system, and reproducing in a condensed form all the essential conditions of a given environment.

This point of view also gives us a definite connotation for the term 'meaning.' Mind, from the beginning, has taken the form which the environment has given it.¹ The mental contents have always been 'meaningful' for the organism. A given complex of sensations is correlated with such and such a 'thing' of the outside world. The perception has such and such uses; the object is to be met by such and such adaptations. But the functions of the primitive mind were comparatively few. Each of its attitudes was self-sufficient. Every pattern was an independent pattern, and carried with it its own 'meaning' for the organism. But with the development of memory came the function of 'remote adaptation.'² The constant recurrence of given complexes in a multitude of different connections added something to the 'meaning' of a presentation: namely, the previous significance of similar presentations. As development continued and experience widened, the recognition of identity in 'meanings' became more and more automatic, became pushed back farther and farther into the margin of consciousness. In the adult apperceptive consciousness there is, as we have seen, no constancy in the quality and modality of the focal constituents. With very few exceptions—of which the 'constant supplements' are instances—the same symbol arouses at different times focal references which may be uniform or disparate, consistent or inconsistent; and yet the meaning of the symbol in combination with other symbols is perfectly unequivocal. It is reasonable to suppose that the marginal elements furnish the essential uniformity, and compensate the

¹ Cf. Titchener, E. B.: *A Primer of Psychology*. New York, 1899, p. 197.

² Cf. Bentley, I. M.: *This Journal*, Vol XI, No. 1 (1899), pp. 14 ff.

apparent inconsistencies.¹ In other words, the consciousnesses that are correlated with like adaptations are similar, not necessarily in their focal, but in their marginal constituents. Interpreted as marginal constituents, the kinaesthetic factors as well as the organic sensations come to their true rights. When the observer's attention is centered upon the stimuli—upon the symbols—he is in a 'sentence' mood, or a 'word' mood, or a 'mutilation' mood: *i. e.*, there is a certain adaptation in which certain marginal factors are constant. But when the attention shifts to the symbolized situation, the mechanism of the sentence, as such, becomes obscured; there is a new adjustment, resulting in another adaptation, in which certain other marginal factors are constant. In the one case, the sentence is apperceived as an orderly complex of sound units; in the other case it is apperceived as, in itself, a 'meaningful' unit.

The margin and the focus of consciousness play—if the expression may be pardoned—the one into the hands of the other; but the nature and modality of the elements which are to come into the focus, and the pattern of the elements which are to remain in the margin, are determined by the needs of the organism. It is the peculiar office of apperception, as the functional side of attention, to interpret the new presentation in the light of its significance to the organism. If it be a complex of visual sensations, supplemented by certain tactual and motor associates, and by the verbal idea 'table,' it may 'mean' an object to write on or an object to eat from, an object to be sold or an object to be bought, according as the mind is adjusted to the situation. If it be an auditory or visual complex, "The play is bad," it may 'mean' a mere combination of forms, a forbidden lead at whist, or a poorly staged drama. In each of these cases the presentation is met by a totally different adjustment of the organism, correlated on the side of mind with a peculiar and fitting pattern of consciousness. In this pattern certain typical sensations—centrally and peripherally aroused—occupy the margin of consciousness. They are determined largely by the individual, and are constant with him for this type of adaptation. Certain other elements occupy the focus of consciousness. These are determined almost entirely by the

¹ Cf. James, W.: *Principles of Psychology*, N. Y., 1890. Vol. II, p. 49. "The meaning is a function of the more 'transitive' parts of consciousness, the 'fringe' of relations which we feel surrounding the image, be the latter sharp or dim." James's position is practically that which we have taken above, except that he has approached the question from the standpoint of epistemology, rather than from the standpoint of genetic psychology. As a rule, an appeal to genesis is much more satisfactory than an appeal to epistemology, as the history of the psychological space theories abundantly shows.

existing environment, or by the exigencies of the situation which is faced.

Nor is this point of view inconsistent with that¹ which gives to the kinaesthetic elements the duty of carrying the meaning of a presentation. Reaction to the environment was the primary function of the primitive mind. When the development of memory brought with it the complications arising from the consciousness of former experiences, the motor memories became of fundamental importance in the new 'remote adaptation.' In the adult consciousness, as we have studied it, even symbolic apperception involves adjustment and adaptation, and adjustment and adaptation involve motor reactions. The kinaesthetic elements are predominantly marginal elements and the marginal elements 'carry the meaning.'

¹ Cf. Bawden: *op. cit.*, pp. 44 ff. Münsterberg's 'Action' theory of meaning must be left for a more detailed discussion. Cf., in this connection, Münsterberg, H.: *The Physiological Basis of the Mental Life*. Science, N. S., IX (March 24, 1899) pp. 442 ff.; also Breese, B.: *On Inhibition*. *Psychological Review Monograph Supplement*, Vol. III, No. 1, pp. 47 ff.